APPENDIX E – CENTRAL COAST ITS PROJECT DESCRIPTIONS

Recommended Central Coast ITS Projects

A series of candidate ITS Projects was developed for the Central Coast ITS Strategic Plan based on the identified problems, the Market Package priorities, and the existing ITS infrastructure. By "ITS Project", we mean specific ITS Market Packages or Market Package subcategories that are tied to specific locations (e.g., US 101, SR 1, etc.), existing systems (e.g., traffic management, transit operations, emergency services, etc.), implementation timeframe (i.e., short, medium, long), and responsible agencies (e.g., Caltrans, CHP, etc.).

Appendix E provides a full listing of projects developed within the Strategic Plan process. It presents Exhibit E.1, which indicates project name and locations, plus a more detailed description of the various projects. In many cases, multiple locations and responsible agencies are listed under the same project description to provide an indication of the anticipated extent of deployment in the Central Coast. It is expected that this list of ITS Projects will be expanded or modified over time as new ideas are generated and as technology changes, offering opportunities that had not been anticipated. In any case, all of these ITS Projects will also need to be accommodated within the Central Coast Regional ITS Architecture [as described in Section 4 (Volume I) and Volume II - ITS Project Implementation Guide].

The Strategic Plan should be modified periodically to reflect these updates, but there is no requirement for the ITS Project to be in the Strategic Plan before it can be programmed. However, the ITS Project will require a determination of conformance with the National ITS Architecture in order to receive federal funds. There is no financial commitment associated with the listing of an ITS Project in the Strategic Plan.

Representative ITS Benefits

Exhibit E.2 represents the table of ITS benefits previously depicted in Section 1 of this document.

Potential ITS Costs

Within each project description, cost information will be presented (as available) in the form of applicable cost range(s) based on real-world experiences. Please note that these costs provide a starting point and possible baseline for future ITS deployment costs applicable to the Central Coast Region. The reader is cautioned about using the costs directly without first examining the assumptions, local conditions, and other factors associated with the particular project.

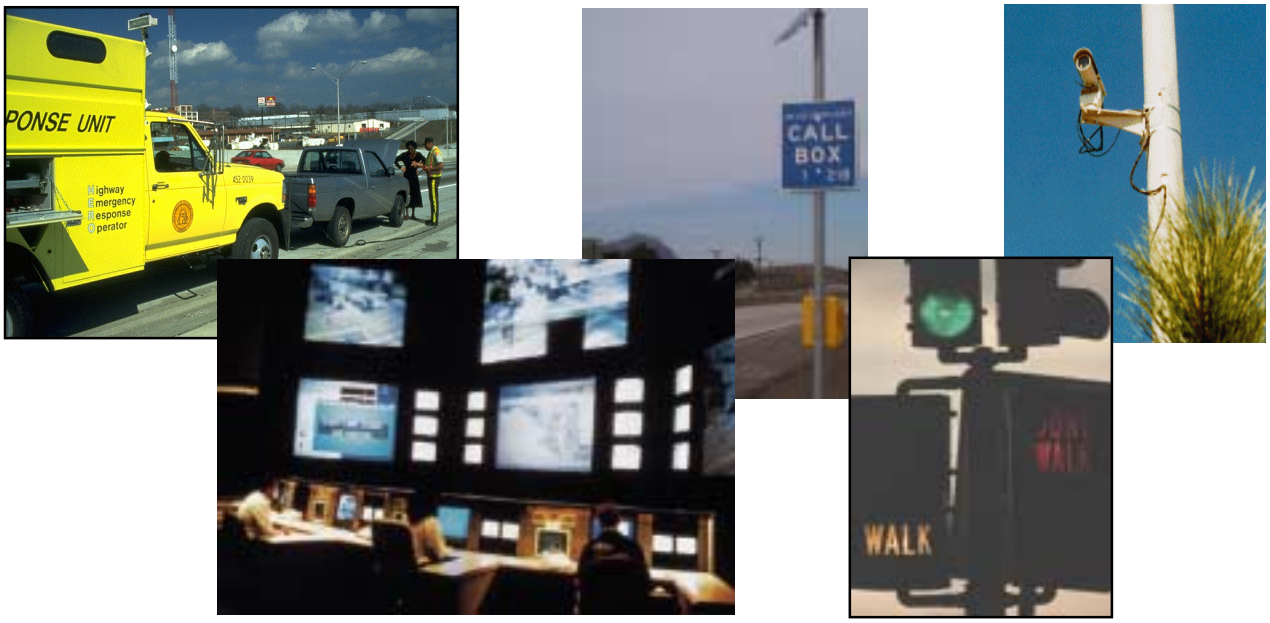
Central Coast ITS Project Descriptions

Most of the project descriptions were developed by the Consultant Team. In some cases, individual project descriptions were submitted by Regional and Local agencies. Therefore, some may overlap slightly with certain project descriptions that cover a project type that is common among multiple geographic areas. Each project description starts at the top of a new page and contains the following information:

- Project Name
- Project Description
- Relationship to Other Projects
- Specific Problems or Needs Addressed
- Traveler and Agency Benefits
- Relationship to ITS Market Packages
- Relationship to the Regional ITS Architecture
- Time Frame (short → within 5 years, medium → 5-10 years, and long → over 10 years)
- Implementing Lead Agency(s)
- Potential Costs (as available)
- Possible Funding Sources (where appropriate)
- Follow-up Actions (where appropriate)

Exhibit E.2 – Representative ITS Benefits

Freeway Management Systems Benefits *(Ramp Metering)*	
Freeway Travel Time	**Decrease 20% to 48%**
Freeway Travel Speed	**Increase 8% to 60%**
Freeway Capacity	**Increase 3-5%**
Accident Rate	**Decrease 15% to 50%**
Fuel Consumption	**Decrease fuel used in congestion 41%**
Traffic Signal System Benefits *(Coordinated Signal Systems and Traffic Surveillance Systems)*	
Travel Time	**Decrease 8% to 20%**
Travel Speed	**Increase 14% to 22%**
Vehicle Stops	**Decrease 22% to 41%**
Delay	**Decrease 15% to 44%**
Fuel Consumption	**Decrease 6% to 12%**
Emissions	**Decrease Carbon Monoxide (CO) emissions 5% to 13%**
	Decrease Hydrocarbon (HC) emissions 4% to 10%
Incident Management Program Benefits	
Incident Clearance Time	**Decrease 8 minutes for stalls**
	Decrease roadside assistance response time 5-7 minutes
Travel Time	**Decrease 10% to 42%**
Fatalities	**Decrease 10% in urban areas**
Traveler Information System Benefits *(Kiosks)*	
Travel Time	**Decrease 17 minutes (20%) in incident conditions**
	Decrease 8% to 20% for equipped vehicles
Delay	**Decrease up to 1900 vehicle-hours per incident**
Fuel Consumption	**Decrease 6% to 12%**
Emissions	**Decrease Volatile Organic Compounds (VOC) 25% from affected vehicles**
	Decrease HC emissions 33% from affected vehicles
	Decrease Nitrous Oxide (No_x) emissions 1.5% from affected vehicles
Transit Management System Benefits *(Automated Vehicle Location Systems)*	
Travel Time	**Decrease 15% to 18%**
Service Reliability	**Increase 12% to 23% in on-time performance**
Security	**Decrease incident response time to as little as one minute**
Cost Effectiveness	**45% annual return on investment**



TRAFFIC MANAGEMENT & SAFETY

Project Name:
Regional Transportation Management Center (TMC)

Project Description:
This project involves the creation of a Transportation Management Center (TMC) for the Central Coast Region. The project involves a cost-effective application scaled to the needs of the 5-County project area → Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara. The Central Coast TMC would be jointly operated by Caltrans District 5 and CHP staff and the facility housed at a mutually-agreeable location (perhaps centrally-located in San Luis Obispo). It is proposed that the following statements be used in the Central Coast as the guiding principles for TMC implementation and operation:

- The purpose of the TMC will be to provide a central clearinghouse facility to focus data collection, information dissemination, and operational decision-making activities in order to aggressively manage the transportation system to reduce congestion and provide for the safe and efficient movement of people, goods, services, and information in order to promote economic vitality and enhance the quality of life throughout the Central Coast
- The TMC will provide access to other agencies for selected elements or functions
- Information and operational decisions for non-state highways will rest with the owner/operator (e.g. County for county roadways, transit agency for transit operations)
- Decisions on implementation of second-tier TMCs will be at the discretion of these other operating entities
- Caltrans will proactively coordinate with local agencies to minimize impacts on the local street system
- An operations committee will be established as a vehicle for discussing state/local operational issues

Functions to be included in the TMC include the following at a minimum:

- Control of ramp meters
- Control of changeable message signs (CMS) and highway advisory radio (HAR)
- Control of closed circuit television (CCTV)
- Monitoring of environmental sensors on state highways (control functions, if any, tied to project sponsor, unless other arrangements are made)
- Recommendation of diversion timing plans (not control – control still exercised by local agencies except under pre-specified plans developed jointly by Caltrans and local agencies)
- Coordinate maintenance and construction real-time traffic management activities (including lane closures)
- Coordinate special event activities
- Coordinate with Caltrans Headquarters Maintenance to update the Caltrans Highway Information Network (CHIN)
- Pursue and maintain multi-modal agency and private sector partnerships
- Provide a focal point to the media/ISPs for traveler information dissemination
- Coordinate CHP and Caltrans communications center activities (including dispatching)
- Inform other Regional TMCs (e.g., San Francisco Bay Area, Southern California, etc.) and Headquarters TMCs of major events and occurrences

Other functionality issues include the following:

- CHP will have access to CCTV (including secondary level control)
- Caltrans has exclusive responsibility for ramp metering operations and CHP for enforcement

- CHP can recommend CMS sign messages to Caltrans, who is responsible for implementation
- Caltrans District 4 will have primary responsibility for state highways in Santa Cruz county (primarily SR 17 and portions of SR 1) that have commuting patterns associated with the San Francisco Bay Area
- The Bay Area Regional TMC will have the ability to perform Central Coast TMC operations during times when CHP/Caltrans District 5 staff are unavailable
- The Southern California Regional TMC will be interfaced with the Central Coast TMC and will have second-tier responsibility for Santa Barbara County, should CHP/Caltrans District 5 staff be unavailable
- Local agencies have access to camera viewing, not control
- Traffic congestion map will be available on Internet
- Camera images will be available on internet
- Portable traffic management systems (PTMS) will be controlled by the owning agency → PTMS units will have the potential for operation from remote locations by the unit owner or from the Central Coast TMC
- Other types of information dissemination (e.g. for special events) will be the responsibility of the event sponsor
    - The TMC will have the capability to receive input from information providers and to make the information available to agencies with connections to the TMC
    - Maximum use will be made of the internet as the communications linkage
- Access to the Central Coast TMC will be provided either through dial-up computer terminals at individual agencies or through the Internet → these interfaces need to be designed to maximize security and operational integrity of all systems
- The Central Coast TMC will integrate systems and coordinate activities with local transit, law enforcement, and other emergency service agencies

Relationship to Other Projects:
The Central Coast TMC will be the focal point of region-wide traffic operations. It will be responsible for monitoring and controlling network surveillance, CCTV, ramp meters, changeable message signs, and highway advisory radio, all of which are described in other project descriptions. It will provide for connections to CHP divisions, other local control centers (law enforcement and emergency service), transit management centers, and transportation management centers, when desired by local agencies. These connections will be made through dial-up network connection or through the Internet.

Specific Problems or Needs Addressed:
- Recurring congestion on freeways and major roadways in the Central Coast
- Congestion caused by traffic incidents, construction, special events, natural disasters, and other causes
- Excess emissions and fuel consumption due to congestion
- Need for improved routing and traffic management information for public agencies, emergency vehicles, and the public

Traveler and Agency Benefits:
- Improved speeds on freeways
- Improved public information in response to major incidents, weather problems, and natural disasters
- Reduced delay made possible through better routing decisions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Primary component of Regional Traffic Control, Freeway Control, Traffic Information Dissemination, and Incident Management market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Proposed for implementation by 2005

Implementing Agency:
- Caltrans District 5 and CHP will be the lead agencies
- An Operations Committee (e.g., Caltrans, CHP, local agencies, etc.) will provide advice and support

Potential Costs:
The cost to deploy a TMC varies widely due to the desired level of capabilities/operations included at the center. A specific "TMC Operations/Facility Study" needs to be undertaken as a separate contract at an in-depth level that most likely would require a similar level-of-effort/cost as this initial Strategic Planning project. A TMC's roles/responsibilities, functionality, operations, staffing requirements, facility layout, time of operations, data exchange/sharing agreements, inherent systems/technologies, etc., would need to be worked out in more detail within and between all involved stakeholders.

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Traffic Control • Traffic control systems • Central transp. mgt.	$2-4 million	$1.5-2 million	• Capital Costs → Building, software, hardware, video & graphic displays, communications, computers, etc. • O&M Costs → Staffing & communications w/ roadside devices
TMC Roadside Location • Per signalized int. • Per ramp meter	 $100 K $100 K	 $6-8 K $6-8 K	• Capital Coasts → Equipment & systems integration for surveillance & control • O&M Costs → Staffing & communications
TMC Incident Management • TMC Enhancements • Roadside Monitor • Emergency Center Link	 $500 K $80 K $150 K	 $500 K - 1 mil. $4 K $150 K	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
TMC Multi-modal Functions (e.g., signal priority, HOV, reversible lanes, etc.) • TMC Enhancements (e.g., signal priority, HOV, reversible lanes) • Surveillance & monitoring	 $400 K $400-600 K	 $300 K $50-75 K	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $500 K per year for four (4) years to provide hardware and software to download video images, surveillance station data, and control ramp meter operations

Follow-up Actions:
- Caltrans to explore funding options and secure funding
- Caltrans and CHP will organize the Operations Committee to guide development of the Regional TMC
- CHP and local agencies to specify their mechanism for connection to the TMC (if any)

Project Name:
Surveillance Stations on highways in the Central Coast

Project Description:
The purpose of the project is to install roadway sensor/detection devices (most likely inductive loop detectors) at specific locations to monitor roadway conditions (e.g., volume, speed, occupancy, headway, etc.). Surveillance station loops will be installed in the following manner:

- Where ramp meters are installed, will infill between ramp meter mainline loop detectors at approx. 1/2 mile spacing
- Where ramp meters are not installed, will be located at 1/2 mile intervals

This combination of surveillance station loops and ramp meter mainline loop detectors will provide continuous, 1/2 mile surveillance on Central Coast highways. When highways identified as candidates for surveillance loops are widened or rehabilitated, installation of surveillance loops should be included in the project, and Caltrans District 5 Traffic Operations consulted for spacing and location specifications. In addition, the surveillance station controllers' should have the ability to capture and store the data for monitoring, control, and planning applications. It is anticipated that surveillance stations will be located along the freeways in the following areas:

Santa Barbara County:
US 101 - SR 150 Junction (Ventura County line) to Hollister Ave.
US 101 - Clark Ave So. of Santa Maria to San Luis Obispo County Line
SR 1 - start of expressway (Lompoc) to SR 135 N (Orcutt)
SR 135 - Santa Antonio Rd to SR 1 S

San Luis Obispo County:
US 101 - Santa Barbara county line to northern San Luis Obispo city limits
US 101 - Cuesta Grade
US 101 - SR 58 to SR 46 east
SR 1 - US 101 to end of freeway section (Cayucos)
SR 46 - US 101 to east

San Benito County:
SR 25 - Hollister city limits to Santa Clara county line
SR 156 - US 101 to SR 152/Santa Clara County line

Monterey County:
US 101 - Airport Blvd. to Crazy Horse Rd
SR 1- start freeway (Carmel) to end freeway/SR 156 (Castroville)
SR 68 - SR 1 to US 101

Santa Cruz County:
SR 1 - Freedom Blvd. O.C. to SR 1/SR 17 Junction
SR 17 - SR 1/SR 17 Junction to Santa Clara County Line

Relationship to Other Projects:
- The surveillance stations will be strategically located to complement the ramp metering system
- The surveillance stations will be a primary provider of data/information for the Central Coast TMC to monitor, control, and manage the roadway network (e.g., incident management, CCTV surveillance, traveler information dissemination, coordinated dispatching activities, etc.)

Specific Problems or Needs Addressed:
- Improve ability to manage the roadway network by monitoring traffic characteristics (e.g., volume, speed, occupancy, headways, etc.)
- Improve ability to detect and respond to highway incidents
- Improve ability to provide traveler information

Traveler and Agency Benefits:
- Provides information that can be used by traffic engineers to improve traffic flow, reduce congestion, and delay caused by recurring or non-recurring incidents
- Provides information that can be used by emergency response providers on incidence response
- Provides more accurate information to the public

Relationship to ITS Market Packages:
- Part of Network Surveillance market package

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway Sensor (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans District 5 10-Year Plan (Appendix G)

Implementing Agency:
- Caltrans will be the lead agency
- Local agencies support as necessary

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Surveillance stations	$30,000	$3,000	$4,500	$4,500	$3,000	$45,000	$3,000	Per location

- Other cost estimates include the following:
  - Inductive Loops → $5-15 K per location
  - Video Imaging Detection → $40-50 K per location
  - Radar Detection $20-30 K per location

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $20 K per surveillance station for both directions of the highway (primarily using inductive loop detectors)

Project Name:
Automated Real-Time Traffic Counts for the University of California at Santa Cruz (UCSC)

Project Description:
Automated real-time traffic counters using inductive loop detectors in the roadbed at the two campus entrances would provide accurate data for traffic systems management on- and off-campus.

Relationship to Other Projects:
- Potential inclusion of traffic data at City of Santa Cruz TMC for special event management

Specific Problems or Needs Addressed:
- The campus semi-annually conducts traffic counts at the two entrances to campus as well as other roadways on campus
- Having accurate and consistent counts conducted at the entrances would provide the campus and City with information on the traffic volumes, types of vehicles, and times of travel
- This information can be made consistent with City monitoring as well as other campus traffic monitoring programs

Traveler and Agency Benefits:
- Data gathered will assist the campus (and City) in providing additional TDM programs to serve the times and travel patterns of campus commuters
- In addition, having consistent data throughout the years will be beneficial in campus traffic monitoring

Relationship to ITS Market Packages:
- Part of Network Surveillance market package

Relationship to Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- UCSC will be the lead agency

Potential Costs:
- Inductive Loops → $5-15 K per location

Project Name:
Ramp metering at strategic locations on selected Central Coast highways

Project Description:
Ramp meters are traffic signals located upstream from the merge point of on-ramps with the freeway mainline. Operating on short cycles, the ramp meters allow vehicles onto the freeway one or two at a time. The purpose is to obtain maximum utilization from the available freeway lanes and to improve the merging of traffic onto the freeway. The project will locate ramp meters, in appropriate phases (per Caltrans' 10-Year Plan), at on-ramps on the following sections of freeway:

Santa Barbara County:
US 101 - SR 150/Ventura County line to Hollister Ave. (Santa Barbara Area)
US 101 - Clark Ave to San Luis Obispo County Line (Santa Maria Area)

San Luis Obispo County:
US 101 - SR 166/Santa Barbara county line to Los Berros (Nipomo Area)
US 101 - El Campo to Lower Higuera (Five Cities Area)
US 101 - Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area)
US 101 - SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area)
US 101 - Vineyard to SR 46 east (Templeton/Paso Robles Area)

San Benito County:
None

Monterey County:
US 101 - Airport Blvd. to Boronda (Salinas Area)
US 101 - Russel Rd/Espinosa Rd. to Crazy Horse Rd. (Prunedale Area)
SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula)

Santa Cruz County:
SR 1 - Freedom Blvd. to SR 1/SR 17 Junction (Emeline)
SR 17 - SR 1/SR 17 Junction to Santa Clara County Line

Ramp meters will be installed based on the general phasing indicated in the Caltrans District 5 Ramp Meter Development Plan. In addition, metering decisions will be made in coordination with local government and will be based on criteria that indicate when metering may be appropriate, such as the following factors:

- Level of mainline congestion (i.e., need dependent on amount of traffic growth in the future)
- Availability of parallel surface streets
- Storage capacity of the ramps
- Safety considerations

The ramp metering system will be designed according to Caltrans' Ramp Meter Design Guidelines, existing standards, and use software developed for other Districts. A communications analysis will be conducted for each area where ramp metering and surveillance is being planned to determine the most cost-effective communications solution available at the time. Individual ramps will be evaluated for demand and potential diversion from adjacent ramps during the PSSR stage before installing meters. If meters are not indicated when the system segment is installed, ramps are re-constructed or modified, or a new interchange is added,

underground conduit, and ramp and freeway loops will be installed for surveillance purposes. In addition, HOV lanes and CHP enforcement pads will be provided on existing ramps where warranted, and where excessive cost and R/W will not be involved.

In areas where ramp metering is implemented, a limited public information campaign will be undertaken prior to initiation to ensure that local motorists understand the reasons for the system and are aware of their obligations under the law.

Relationship to Other Projects:
The successful operation of ramp meters is dependent on a surveillance system that provides information for ramp metering decisions. A communications system will be needed to link the ramp meter controllers with the network surveillance system and to link the ramp meter controllers with the Central Coast Traffic Management Center to monitor the metering operation. These three projects need to be implemented together. However, ramp meters could be under local control during an early phase (i.e. not linked to the TMC).

Specific Problems or Needs Addressed:
- Recurring and non-recurring congestion on freeways
- Platoons of vehicles released from arterial traffic signals at on-ramps, degrading merging operation
- Tendency for local traffic to use freeways

Traveler and Agency Benefits:
- Helps to optimize flow on freeways
- Provides smoother merging operation
- Reduces accidents on freeway
- Reduces congestion on freeway caused by local traffic

Relationship to ITS Market Packages:
- Part of Freeway Control market package

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans District 5 10-Year Plan (Appendix G)

Implementing Agency:
- Caltrans will be the lead agency (in consultation with CHP)
- CHP and the affected local governments will support as necessary

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Freeway Control • Ramp metering	$55,000	$5,500	$8,250	$8,250	$5,500	$82,500	$5,500	Per location

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $200 K per ramp meter (including CCTV, mainline loops, ramp meter, and telephone service for data and video image
- Mitigating measures for traffic relief on local streets is not included in the budgeted cost estimates

Project Name:
Closed Circuit Television (CCTV) surveillance on highways in the Central Coast

Project Description:
The purpose of the CCTV cameras will be to provide visual surveillance for more heavily traveled roadways in the Central Coast. A "slow-scan" video technology approach is proposed to minimize communications costs. Cameras will have full pan, tilt, and zoom capability. Two approaches are possible, to be determined through further project development and investigation of technologies and costs:

- Provide 24-hour surveillance using dedicated telephone lines.
- Activate surveillance only when triggered by speeds below a user-specified threshold as determined by radar detectors mounted on the same pole or other nearby strategic locations. The cameras should also be capable of being activated on-demand.

The video will be communicated to the Central Coast Transportation Management Center (TMC). The video will be made available to the California Highway Patrol (CHP) and to participating local police departments to assist in traffic management and incident management, as necessary. Discussions will occur concerning making the video available to other potential users. It is anticipated that CCTV cameras will be located along the freeways in the following areas:

Central Coast Region:
As part of all future ramp meter installations

Santa Barbara County:
US 101 – SR 150/Ventura County line to Hollister Ave. (Santa Barbara Area)
US 101 – Clark Ave to San Luis Obispo County Line (Santa Maria Area)

San Luis Obispo County:
US 101 – Cuesta Grade (San Luis Obispo to SR 58)
US 101 – SR 166/Santa Barbara County line to Los Berros (Nipomo Area)
US 101 – El Campo to Lower Higuera (Five Cities Area)
US 101 – Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area)
US 101 – SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area)
US 101 – Vineyard to SR 46 east (Templeton/Paso Robles Area)

San Benito County:
US 101 – Monterey County line to 7.5 miles north

Monterey County:
US 101 – around SR 156 junction
US 101 – Airport Blvd. To Boronda (Salinas Area)
US 101 – Russell Rd/Espinosa Rd. to Crazy Horse Rd. (Prunedale Area)
SR 68 from SR 1 to Salinas
SR 56 from SR 1 to US 101
SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula)

Santa Cruz County:
SR 17 – SR 1/SR 17 Junction to Santa Clara County Line
SR 1 – Freedom Blvd. O.C. to SR 1/SR 17 Junction

Relationship to Other Projects:
- The CCTV is viewed to be an early implementation component of the Central Coast TMC

Specific Problems Addressed:
- Recurring congestion at each of the above locations
- Incident-related congestion and construction activity that occurs in these sections

Traveler and Agency Benefits:
- Provides mechanism for verifying the occurrence and location of incidents
- Allows more accurate and timely decisions on incident response, including necessary on-scene equipment and traffic management decisions
- Provides information that can be used in traffic reports to the public
- Reduces congestion through more rapid and timely response to incidents

Relationship to ITS Market Packages:
- Part of the Network Surveillance market package
- Supports the Broadcast Traveler Information and Interactive Traveler Information market packages

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans District 5 10-Year Plan (Appendix G)

Implementing Agency:
- Caltrans will be the lead agency
- CHP, local police departments, and Regional Transportation Planning Agencies will serve as supporting agencies

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • CCTV	$40,000	$4,000	$6,000	$6,000	$4,000	$60,000	$4,000	Per camera

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $150 K per stand-alone CCTV site, including video camera, mounting, utilities, poles, and codec for the TMC (if necessary)

Project Name:
City of Santa Cruz ITS Phase I, Fiber Optic Network and Traffic Monitoring Centers

Project Description:
The purpose of the project is to establish a communications infrastructure for ITS applications and to retrieve live video from intersections already having cameras in place. The video will assist traffic engineers, signal maintenance technicians, and police and fire departments in traffic management and incident management. The video can be made available to other agencies. Specific applications include the following:

- Upgrade four existing signal interconnect systems to fiber optic: Ocean Street, Water Street, Laurel Street, and Soquel Avenue
- Install fiber optic cables and conduits to communicate with the four signal systems and 32 cameras (video detection cameras) from City Hall, Corporation Yard, Police Department, and Fire Department
- Install traffic monitoring centers in the City Hall, Corporation Yard, Police Department, and Fire Department

Relationship to Other Projects:
- The fiber optic network and the traffic monitoring centers are considered the first phase of the City of Santa Cruz's ITS program

Specific Problems or Needs Addressed:
- Communication with the signal systems and CCTV video cameras
- Recurring and non-recurring traffic congestion at the intersections
- Response to signal timing deficiencies and signal problems

Traveler and Agency Benefits:
- Provides improved traffic flow with more responsive traffic signal operation
- Reduces congestion and delay caused by recurring or non-recurring incidents
- Provides information that can be used by emergency response providers on incidence response
- Provides more accurate information to the public

Relationship to ITS Market Packages:
- Part of Network Surveillance market package

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway Sensor (Roadside) subsystems

Time Frame:
- By 2004

Implementing Agency:
- City of Santa Cruz as lead agency
- SCCRTC as supporting agency

Potential Costs:
- For fiber-optic cable, approx. $55/meter (includes both conduit & cable)
- TMC & systems integration costs will vary depending upon center capabilities

Project Name:
Changeable Message Signs (CMS) at strategic locations on Central Coast highways

Project Description:
The primary purpose of CMS signs is to provide motorists with information as to closures, major delays, or incidents at points where they have options for avoiding the delay. CMS signs will primarily be installed along state roadways and the messages controlled by Caltrans District 5 (in conjunction with the CHP). CHP and Caltrans District's 4 and 7 would have access to sign control functions for use when District 5 staff is unavailable. CMS messages will be drawn from a standard library, but with special messages authorized at management staff levels, or as required by Caltrans protocol. Caltrans will work with individual jurisdictions to determine priorities, timing, and operational protocols. Because some of these facilities are not high-volume, a high-cost sign (such as might be used on a freeway) may not likely be warranted at every location. In addition, other situations must be sensitive to scenic views and the environment. Caltrans will work with the jurisdictions to determine the most cost-effective technology for each application. In some cases, it may be more cost-effective to rely on the use of portable CMS signs [see Portable Traffic Management Systems (PTMS)] at locations only when the need occurs (e.g. long-term roadway closure). Recommended CMS locations include the following:

Santa Barbara County:
- Junction of US 101 & SR 154 (north & south)
- Junction of US 101 & SR 1 (south in Gaviota Pass)
- Junction of US 101 & SR 166
- Junctions of SRs 1 & 150 and SRs 1 & 246
- Junctions of SR 246 & US 101 and SRs 246 & 154

San Luis Obispo County:
- Junction of US 101 & SR 1 (north in SLO)
- Junction of US 101 & SR 46
- Junction of SRs 1 & 46
- US 101 - at juncture ends of Cuesta Grade
- Central Valley (SR 41, SR 46, & SR 166)

San Benito County:
- US 101
- SR 25
- SR 156
- Hollister Municipal Airport (SR 156)

Monterey County:
- Junction of US 101 & SR 156 (south near Prunedale)
- Junction of US 101 & SR 156 (north)
- Junction of SRs 1 & 68 (south)
- Junction of SRs 1 & 156

Santa Cruz County:
- SR 1 (and nearby local roads)
- SR 17 (and nearby local roads)
- Santa Cruz Boardwalk area

Relationship to Other Projects:
The reason for CMS is to provide a way to communicate directly and quickly with the traveling public when the need arises. This may include hazard warnings (e.g. fog), emergencies (e.g. a road washed out or earthquake damage), or major traffic problems (e.g. an extended roadway blockage). Information on these events will come from various sources, both automated and manual. Therefore, the project will require inputs from weather detection systems, applicable roadway surveillance systems, and law enforcement and emergency service agencies.

Specific Problems or Needs Addressed:
- Non-recurring congestion
- Need to improve emergency response
- Safety
- Need to provide traveler information (particularly in the case of emergencies and special events)

Traveler and Agency Benefits:
- Reduced delay
- More reliable trip times for moving people and goods
- Fewer "surprises" from roadway closures
- Improved public relations

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Related to Network Surveillance, Regional Traffic Control, Incident Management, and Emergency Response market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see Caltrans District 5 10-Year Plan (Appendix G)
- Some locations may be appropriate for portable CMS in the near future (deployed on an as-needed basis)

Implementing Agency:
- Caltrans will be the lead agency
- CHP and affected local governments will provide support (as necessary)

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • CMS	$200,000	$20,000	$30,000	$30,000	$20,000	$300,000	$20,000	Freeway CMS

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $150 K per CMS, including CMS structure, hardware, software, power source, and phone service

Project Name:
Announcement of University of California at Santa Cruz (UCSC) Campus Closures/Detours

Project Description:
To utilize the existing CMS system on SRs 1 and 17 in Santa Cruz County to announce campus closures and/or traffic detours in order to intercept campus commuters before they get to campus.

Relationship to Other Projects:
- Would need to coordinate with administration of existing CMS system in Santa Cruz County

Specific Problems or Needs Addressed:
On the rare occasion of disaster or long-term power outages on campus, the campus does close and needs to disseminate that information to its staff, faculty, and students who would be commuting to campus. Utilizing the existing CMS system on SRs 1 and 17 to make these announcements will intercept these commuters before they drive all the way through the neighborhoods to campus.

Traveler and Agency Benefits:
- Provides real-time, up to date traveler information for UCSC commuters

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Related to Network Surveillance, Regional Traffic Control, Incident Management, and Emergency Response market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- UCSC, Caltrans, CHP, and Santa Cruz County

Potential Costs:
- It is anticipated that this project will only require inter-agency cooperation when UCSC-related messages are requested to be displayed on the CMS

Project Name:
Highway Advisory Radio (HAR) at selected locations on Central Coast highways

Project Description:
Highway advisory radio (HAR) allows for the dissemination of information directly to the traveler through the AM radio. Most HAR transmitters have operated on the 530 and 1610 frequencies, but other frequencies have been used as well. Information could be disseminated for a variety of traffic-related reasons, such as construction, congestion, incidents, other highway emergencies, etc. Proposed locations for HAR in the Central Coast include:

Santa Barbara County:
US 101/SR 154 in Santa Barbara
US 101/SR 154 San Marcos Pass

San Luis Obispo County:
US 101/SR 1 in San Luis Obispo
US 101/SR 58 in Santa Margarita
US 101/SR 46 in Paso Robles

San Benito County:
US 101
SR 25
SR 156

Monterey County:
SR 1/SR 68 Junction
US 101/SR 156 Junction

Santa Cruz County:
SR 1/SR 17 Junction

Relationship to Other Projects:
HAR installations would be tied into the regional TMC. A pre-packaged set of messages would be composed, based on typical events that may occur in areas where the signs were installed. Special messages could also be composed by TMC staff. Communications would likely be by hardwire or wireless phone service.

Specific Problems or Needs Addressed:
- Non-recurring congestion
- Need to improve emergency response
- Safety
- Need to provide traveler information (particularly in the case of emergencies and special events)

Traveler and Agency Benefits:
- Reduced delay
- More reliable trip times for moving people and goods
- Fewer "surprises" from roadway closures
- Improved public relations

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Related to Network Surveillance, Regional Traffic Control, Incident Management, and Emergency Response market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans District 5 10-Year Plan (Appendix G)

Implementing Agency:
- Caltrans will be the lead agency
- CHP and affected local governments will provide support (as necessary)

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • HAR	$50,000	$5,000	$7,500	$7,500	$5,000	$75,000	$5,000	Per location

Possible Funding Sources:
- Within its 10-Year Plan, Caltrans District 5 has budgeted approx. $100 K per HAR site, including HAR transmitter, antenna, utility services, software, and message recorders

Project Name:
Response Strategy Support

Project Description:
This technology is designed to increase roadway safety, reduce motorist delays, and improve the overall efficiency of freeway operations. Agencies use a computer-aided dispatch (CAD) system to alert local resources to incidents. Traffic Management Center (TMC) personnel develop an appropriate response in coordination with emergency management and other incident response personnel to confirmed incidents. Also the same equipment assists the operator by monitoring incident status as the response unfolds. Necessary resources include officers, firemen, paramedics, freeway service patrols, patrol cars, Emergency Medical Technicians (EMT) vans, and helicopters. Included in the resources are Freeway Service Patrols (FSP) offering a wide range of services to stranded motorists at no cost. Services include changing flat tires, providing jump-starts, providing a gallon of fuel, or towing disabled vehicles off the freeway. The coordination can also extend to tow trucks and other field service personnel.

Relationship to Other Projects:
- This project is inter-related with the development of the Central Coast TMC and its associated activities

Specific Problems or Needs Addressed:
- Optimize inter-jurisdictional cooperation to reduce the impacts of incidents

Traveler and Agency Benefits:
- Collection of real-time data from roadway instrumentation
- Enhanced roadway service responsiveness
- Reduce time delay associated with incident-induced congestion
- Improve the ability to handle Hazardous Materials (HazMat) incidents

Relationship to ITS Market Packages:
- Related to the Network Surveillance, Planning Data Collection, and Emergency Management and Enforcement market packages

Relationship to the Regional ITS Architecture:
- Part of the Emergency Management (Center) and Traffic Management (Center) subsystems

Time Frame:
- 2003 to 2008

Implementing Agency:
- Caltrans, CHP, local law enforcement agencies, and emergency service providers will coordinate the implementation of this project

Potential Costs:
Response Strategy Support is an integral component of the Central Coast TMC's operations. Therefore, specific TMC capabilities concerning this project will need to be incorporated into the TMC's planning and design activities. For incident management, integrating traffic and emergency personnel at the Central Coast TMC may reduce these costs, through coordinated staffing and joint use of similar technologies. Some potential cost estimates are provided below for portions of this project:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Incident Management • TMC Enhancements • Roadside Monitor • Emergency Center Link	 $500 K $80 K $150 K	 $500 K - 1 mil. $4 K $150 K	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
Emergency Vehicle Management • Vehicle • Emergency Center	 $3 K $50-75 K	 $400 K $100 K	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Incident Dispatch Coordination & Communications • Hardware (Workstation) • Software • Integration • TMC to EMS Communications • IM Coordinator • Maintenance (5% of Capital Cost) • Roadside-to-TMC Comms.	 $3 K $15 K $180 K $1 K	 $100 K $10 K $3 K	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
Emergency Response Management • Comms. to/from TMC • Emergency Response Plan Database • I/F with Vehicle & Other Agencies • Vehicle Tracking Software • Real-time Traffic Coordination • Hardware (Workstations) • Maintenance (5% of Capital Costs)	 $1 K $25 K $1 K $40 K $10 K $20 K	 $5 K	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

Adapted from "Developing Freeway Incident Management Systems Using the National ITS Architecture", FHWA, 1998

Project Name:
Basic Signal Synchronization/Coordination

Project Description:
Traffic flow on arterial streets is largely controlled by traffic signals at intersections. Synchronization of traffic signals has been a long-standing traffic management strategy for small cities as well as large ones. This set of projects seeks to improve traffic flow on arterial streets through signal coordination. The following projects are anticipated, by each County:

Santa Barbara County:
Hollister Ave.
Upper State Street
Carrillo Blvd.
Main Street
Broadway
Central
North H Street
SR 246 - Solvang city limits

San Luis Obispo County:
Grand Avenue - Arroyo Grande/Grover Beach
El Camino - Atascadero

San Benito County:
SR 25 and SR 156 Near Hollister

Monterey County:
SR 68 - York Road to Torero,
SR 156 - Castroville Blvd to US 101
SR 183 - Castroville Sep. to SR 1

Santa Cruz County:
SR 129 near SR 1
SR 152 near SR 1

Relationship to Other Projects:
- Signal coordination is often a stand-alone activity, but there are reasons to connect it with other projects
- Agencies implementing signal coordination need to consider other enhancements such as emergency vehicle signal pre-emption, and bus pre-emption

Specific Problems or Needs Addressed:
- Recurring congestion on arterial streets
- Slow speeds
- Excess emissions and fuel consumption from idling, acceleration, deceleration

Traveler and Agency Benefits:
- Improved speeds (typically 10 to 20 percent increase from uncoordinated conditions)
- Lower emissions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Projects vary in terms of timeframe (depending on funding and prioritization of local jurisdictions)
- Most will be implemented in first five years

Implementing Agency:
- Lead agency: to be determined in each area, but generally the owner of the arterial street.

Potential Costs:
- Intersection construction costs will vary depending upon status of existing conditions and field equipment
- Communications interconnect → $55/meter (includes both conduit & cable)
- Inductive loops → $1 K per loop
- Intersection controllers → $6 K per controller
- Intersection timing plans → $5 K per int. (includes traffic counts, geometrics, etc)
- System coordination → $25 K per system

Possible Funding Sources:
- CMAQ, STP, PVEA, and local funds

Project Name:
Improved Signal Synchronization for University of California at Santa Cruz (UCSC) Travelers

Project Description:
Improved signal synchronization along Bay and High streets (approaches to UCSC), as well as at new planned signals around or near the campus: Camfac/Coolidge, Hagar/Coolidge, Heller/Empire Grade, and Western/Empire Grade.

Relationship to Other Projects:
- Better traffic flows to areas off-campus to improve commute times and minimize congestion

Specific Problems or Needs Addressed:
- Vehicle travel to campus currently runs around 22,000 ADT and is expected to grow as the campus grows to 15,000 in 2005-06
- Better signal synchronization will improve traffic flows in the area and will reduce traffic congestion in the neighborhoods surrounding UCSC

Traveler and Agency Benefits:
- Improved traffic flows and reduced congestion, especially at peak travel times
- Shorter transit delays with improved traffic flows

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- UCSC

Potential Costs:
- Intersection construction costs will vary depending upon status of existing conditions and field equipment
- Communications interconnect → $55/meter (includes both conduit & cable)
- Inductive loops → $1 K per loop
- Intersection controllers → $6 K per controller
- Intersection timing plans → $5 K per int. (includes traffic counts, geometrics, etc)
- System coordination → $25 K per system

Project Name:
Central Control of Traffic Signals

Project Description:
Basic signal coordination provides signal control for a series of signals on an independent basis, without bringing surveillance or monitoring information to a central location. Central control provides communications to a central point where monitoring and control functions can occur. The capabilities of the central system can vary widely, from simple monitoring of signal controller functions to full graphic display of intersection traffic movement. One of the strengths of central computer control is the ability to design and implement multiple signal timing plans that deal with particular times, or days of traffic that vary from the norm (special events, etc.). Enhanced maintenance monitoring functions can also be provided (immediate identification of failed loops, burned out lamps, etc.). System features will vary by city. New or expanded central signal control systems are anticipated in the following areas:

Santa Barbara County:
City of Santa Barbara
City of Santa Maria

San Luis Obispo County:
City of San Luis Obispo

San Benito County:
None

Monterey County:
City of Monterey
City of Salinas

Santa Cruz County:
City of Santa Cruz

Relationship to Other Projects:
City traffic control systems will likely be a vehicle for connecting to the Regional Transportation Management Center, where warranted. This could include the ability to view freeway CCTV cameras and traffic conditions on the freeway, in addition to controlling arterial street signals. This may be done through the Internet, or through direct connections to the TMC. In addition, provisions need to be made for coordinating with Caltrans traffic signals, where coordination is important. Provision should be made for collecting traffic data for planning purposes (see project related to Planning Market Package). If transit or emergency vehicle pre-emption is anticipated, this needs to be accommodated as well.

Specific Problems or Needs Addressed:
- Recurring congestion on arterial streets
- Slow speeds
- Excess emissions and fuel consumption from idling, acceleration, deceleration

Traveler and Agency Benefits:
- Improved speeds (typically 25 percent increase from uncoordinated conditions)
- Lower emissions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Projects vary in terms of timeframe (depending on funding and prioritization of local jurisdictions)
- Most will be implemented in first five years

Implementing Agency:
- Lead agency to be determined in each area
- Generally considered to be the "owner" of the arterial roadway network

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Surface Street Control • Central Control	$250,000	$25,000	$37,500	$37,500	$25,000	$375,000	$25,000	System costs only

Possible Funding Sources:
- CMAQ, STP, PVEA, and local funds

Follow-up Actions:
- Each City to provide more definitive plan for new/expanded central control at the appropriate time

Project Name:
Motorist-Aid Call Boxes

Project Description:
The California Call Box Program is a motorist-aid system operating on freeways, expressways, and highways throughout the State. It is administered at the County level by local Service Authorities for Freeways and Expressways (SAFEs). The call boxes provide motorists with a direct connection to a CHP communications center. Using this link, motorists can report a road hazard, flat tire, mechanical breakdown, traffic accident, or other incident. Upon receiving a call from a call box, CHP personnel dispatch appropriate assistance, including tow service, law enforcement, fire departments, or emergency medical service (EMS) personnel . Use of the call box is free, but motorists are responsible for paying the resultant roadside assistance charges. Since the program's inception in 1986, a total of 17 SAFEs have been formed, covering 29 of California's 58 Counties, for a total of over 15,000 operational call boxes throughout the State.

Within the Central Coast Region, call boxes are currently located in Santa Cruz, San Luis Obispo, and Santa Barbara Counties, predominantly along US 101, SR 1, and SR 46. One focus of this project is to complement the existing program investment in these Counties by adding call boxes at strategic locations to "fill-in-the-gaps" along their roadway network. In Monterey and San Benito Counties, the focus would be on the initial installation of call boxes along major roadways. Call boxes are being considered for installation at the following locations:

Santa Barbara County:
- US 101
- SR 1
- SR 246
- SR 154
- Remaining State Routes

San Luis Obispo County:
- Rural SR 227
- Remaining State Routes

San Benito County:
- US 101
- SR 25
- SR 156
- Remaining State Routes

Monterey County:
- US 101
- SR 1
- Remaining State Routes

Santa Cruz County:
- SR 1
- SR 17
- Remaining State Routes

Relationship to Other Projects:
- Potential to modify/enhance existing and/or planned call boxes to become "smart" call boxes
- Provide input to Central Coast TMC concerning roadway incidents
- Allows EMS and incident management response strategies to get underway

Specific Problems or Needs Addressed:
- Travelers do not have the ability to readily contact CHP, law enforcement, EMS, etc when they are experiencing problems
- The ability to further enhance roadway network safety in a cost-efficient manner

Traveler and Agency Benefits:
- Improve incident identification (e.g., location, type, severity, etc.)
- Reduce incident response times
- Enhance traveler safety and "peace-of-mind"

Relationship to ITS Market Packages:
- Part of the Incident Management System market package

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- Within each County, the individual RTPA/COG will be the lead agency → SCCRTC, SBCOG, TAMC, SLOCOG, and SBCAG
- Caltrans and CHP will provide support in key areas to ensure the program's success

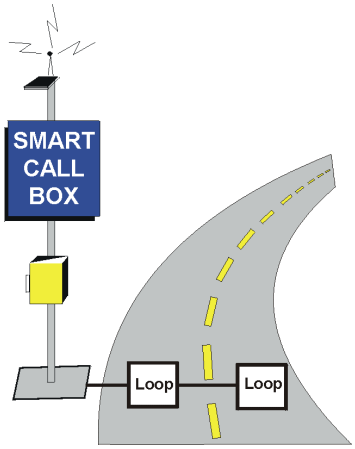
Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Inc. Mgt. System • Call boxes	$4,000	$400	$600	$600	$400	$6,000	$30,000[1]	Per location

1. Denotes cost to manage call box program for a typical County.

Project Name:
"Smart" Call Box Traffic Monitoring Program

- For each of the five (5) Counties in the Central Coast
- Systems would use existing or planned Motorist Aid Call Boxes for traffic monitoring purposes



Project Description:
Traffic counts and classification data form the basis for transportation planning, engineering, and financial analysis. Counts are required when developing, designing, and updating traffic models, conducting corridor studies, developing traffic impact assessments, air quality impact assessments, level of service (LOS) monitoring, etc. Historically, regional count information has been available from Caltrans; however, the process through which Caltrans conducts traffic counts has been adversely impacted by agency funding shortages. Caltrans currently conducts traffic counts at designated control stations in each county (other than at permanent count stations) once every three years. For the other two years, the actual control station count is increased considering application of an average growth rate (typically 2 percent). As a result, the accuracy of the count data is diminished in years when actual counts are not conducted. In addition, the counts are taken during one representative week in each quarter of the year. This count schedule may or may not account for average and/or peak seasonal or average annual traffic conditions along specific routes in the Central Coast Region.

A "Smart" Call Traffic Monitoring Program can use the existing or planned call box system with integrated counter devices, existing Caltrans or other agency inductive loops, and various classification equipment to provide accurate, reliable, and timely traffic census and classification data throughout the Central Coast. The count/classification data collected through "Smart" Call Boxes is needed to calibrate and validate regional and local transportation models. The count/classification data will also enable agencies in the Central Coast, especially Caltrans; to monitor heavily traveled corridors to determine the appropriate application of improvements and funding priority. In addition, the "Smart" Call Box can remotely sense an incident considering average speed data compared to actual speeds of vehicles along a State Route or local highway.

The "Smart"' Call Box is very similar to permanent traffic counter equipment except that downloading the data occurs through a modem call via the cellular network to the "Smart" Call Box. Caltrans and other agencies currently retrieve or download the data manually in the field at traffic control stations or sites to a laptop computer. Remote collection of traffic data allows the agency to reduce staff collection costs and collect year-round data. The Traffic Count Program in each County will be designed in cooperation with Caltrans District 5 personnel to maximize siting benefits.

Specific locations for installation of the "Smart" Call Boxes will be determined on a County-by-County basis. At this time, several locations have already been identified as follows:

Santa Barbara County

US 101	→ 10 locations
SR 1	→ 3 locations
SR 154	→ 4 locations
SR 246	→ 4 locations
SR 166	→ 4 locations

Relationship to Other Projects:
As mentioned above, the "Smart" Call Box Program will rely on availability of the Motorist Aid Call Box Program. In some cases however, the placement of "Smart" Call Boxes may be independent of the Motorist Aid System. Factors that determine the location of a "Smart" Call Box include: an existing or planned call box, the availability of inductive loop detectors, and the need to monitor traffic at specific locations consistent with monitoring program requirements. In addition to Call Boxes, the "Smart" Call Box can remotely sense traffic conditions or incidents along a specific segment. Other projects in the ITS Strategic Plan that would provide similar capabilities include CCTV to monitor road conditions, network surveillance stations (also used to monitor road conditions and capture/store planning data), and planning data collection (including an archive function and additional data collection devices).

Specific Problems or Needs Addressed:
It has been shown that utilizing "Smart" Call Boxes as an ITS technology can provide for significant improvements in the amount and quality of traffic count data for transportation planning, engineering, modeling, and funding allocation purposes. Moreover, traffic count data management and results, as well as Level of Service (LOS) analyses can be directly linked to "Smart" Call Box monitoring efforts and transportation modeling programs to significantly reduce staff operations costs. In addition, use of "Smart" Call Boxes can aid agencies in monitoring the street and highway system to determine remaining capacity and determining how well an individual facility or the entire system is operating.

Traveler and Agency Benefits:
- Improved traffic data available on an as-needed basis through a simple dial-up system
- Reduced travel and greater efficiency for agency personnel

Relationship to ITS Market Packages:
- Related to Network Surveillance, Regional Traffic Control, Incident Management System, and Planning Data Collection market packages

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short- to long-term (depending upon each County's priorities)

Implementing Agency:
- Regional Agencies (CTCs, RTPAs, COGs) and Caltrans District 5

Potential Costs:

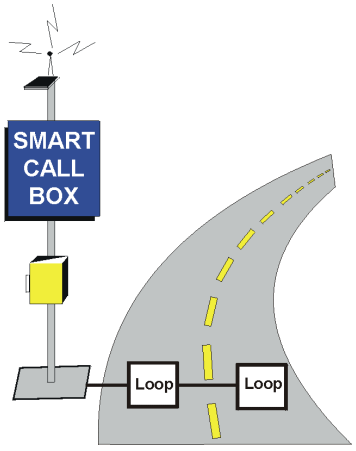
Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Smart call boxes	$6,000	$600	$900	$900	$600	$9,000	$600	Per location[1]

1. Costs do not include loop detectors, traffic control, or communications.

Possible Funding Sources:
- SAFE Program funds, CMAQ funds, STP funds, and other Federal, State, and local funding sources

Project Name:
Environmental Detection System

- Use of Roadway Weather Information Systems (RWIS)
- Use of "Smart" Call Boxes



Project Description:
An Environmental Detection System is proposed at selected locations throughout the Central Coast Region. The system would utilize existing or planned "Smart" Call Boxes in conjunction with RWIS to remotely sense environmental conditions, weather hazards or low visibility conditions (e.g., high winds, fog, blowing dust, wet pavement, etc.). Existing or planned "Smart" Call Box sites can host different types of RWIS sensors to these environmental conditions and send alerts to the CHP's Computer Aid Dispatch (CAD) System. An Environmental Detection System can provide high wind and fog detection, as well as monitor air quality along streets and highways where visibility and high levels of pollutant emissions are known to occur. Pre-designated levels of high wind and visibility are programmed into the system and triggered to activate the "Smart" Call Box to transmit alerts to directly to the CHP's CAD system. The dispatcher at the CHP responds to the alert according to CHP policy. Possible locations include the following:

Santa Barbara County:
U.S. 101 - Ventura County Line to San Luis Obispo County Line
SR 1 - U.S. 101 to San Luis Obispo County Line

San Luis Obispo County:
U.S. 101 - Santa Barbara County Line to Monterey County Line
SR 1 - Santa Barbara County Line to Monterey County Line
SR 41 - Kings County Line to SR 46
SR 41 - US 101 to SR 1
SR 46 - Kern County Line to SR 1

San Benito County:
SR 156 - Santa Clara County Line to US 101

Monterey County:
U.S. 101 - San Luis Obispo County Line to San Benito County Line
SR 1 - San Luis Obispo County Line to Santa Cruz County Line

Santa Cruz County:
SR 17 - SR 1 to Santa Clara County Line
SR 1 - Monterey County Line to San Mateo County Line

Relationship to Other Projects:
As mentioned above, the "Smart" Call Box Environmental Detection System will rely on the availability of the Motorist Aid Call Box Program. In some cases however, the placement of such "Smart" Call Boxes may be independent of the Motorist Aid System. Factors that determine the location of a "Smart" Call Box for environmental detection may include: an existing or planned call box site and/or where the need to monitor high wind and/or fog conditions at specific locations where travel hazards and incidents are known to occur.

Specific Problems or Needs Addressed:
- Need for motorists to know about weather-related hazards

Traveler and Agency Benefits:
- Earlier detection of weather conditions about which the public should be notified
- Remote detection, minimizing labor costs

Relationship to ITS Market Packages:
- Related to Network Surveillance, Regional Traffic Control, Incident Management System, and Planning Data Collection market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway Sensors (Roadside) subsystems

Time Frame:
- By 2005 for initial sensors (continuing expansion in future years)

Implementing Agency:
- Regional Agencies (CTCs, RTPAs, COGs), CHP, and Caltrans District 5

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Smart call boxes	$6,000	$600	$900	$900	$600	$9,000	$600	Per location[1]
Road Weather Info System	$45,000	$4,500	$6,750	$6,750	$4,500	$67,500	$4,500	Per location

1. Costs do not include loop detectors, traffic control, or communications.

Possible Funding Sources:
- SAFE Program funds, CMAQ funds, STP funds, and other Federal, State, and local funding sources

Project Name:
High Occupancy Toll (HOT) Lanes

- Submitted by the Santa Cruz County Regional Transportation Commission (SCCRTC)
- Caltrans District 5 has received approval from FHWA on the HOT Lane "Sketch Plan" re: value pricing projects

Project Description:
This project is listed in the SCCRTC Major Transportation Investment Study (MTIS) adopted August 1999, as a component of one of the region's critical projects for the next 10 to 20 years. As envisioned in this study, north and south bound lanes will be constructed that will be monitored by electromagnetic sensing systems. These HOT lanes will extend from the vicinity of the SR 1 @ SR 17 interchange, approx. six (6) miles south along SR 1 to Freedom Blvd. Any vehicle in these lanes not qualifying as a High Occupancy Vehicle (HOV) will need to display a device that registers it to use the HOT lane. The registration for use of the HOT lanes will be used to generate billing for the registered user of the particular device. It is the sensing and billing portions of this project that are included in this document.

Relationship to Other Projects:

- This project could stand-alone initially or be tied into the Central Coast TMC and/or the San Francisco Bay Area TMC

Specific Problems or Needs Addressed:
SR 1 in Santa Cruz County from SR 17 to Freedom Boulevard currently is at Level-of-Service F as listed in the 1996 Santa Cruz County Congestion Management Plan (CMP). The overall HOT Lane project could lead to an increase in the utilization of buses and car pools due to the availability of a less congested lane at no cost. This less congested lane would allow for greater transit speeds and a higher level of efficiency. For those using the HOT Lanes on a single occupancy vehicle (SOV) basis, this particular project component would create a revenue source from that use.

Traveler and Agency Benefits:

- Travelers using the HOT Lanes by bus, carpool or toll would have a more efficient means of travel
- A governing agency would see a revenue stream from the SOV use of these lanes

Relationship to ITS Market Packages:

- Included in the HOV Lane Management and Electronic Toll Collection market packages

Relationship to the Regional ITS Architecture:

- Included in the Toll Administration (Center), Toll Collection (Roadside), and Vehicle (Vehicle) subsystems

Time Frame:

- 2010-2020

Implementing Agency:

- Caltrans and CHP will most likely be the lead agencies
- Affected local agencies will provide support (as necessary)

Potential Costs:

- Software
  - Conduct toll systems operations
  - Operate violation enforcement system (VES)
  - Operate Customer Service Center (CSC) (e.g., billing, registration, administration, etc.)
  - Approx. $1.5. million
- Hardware
  - Toll system readers/controllers
  - System loops/surveillance
  - Vehicle classification system
  - VES/cameras
  - Toll plaza equipment
  - CSC equipment
  - Approx. $500 K
  - Please note that costs do not include actual building facility construction costs
    - Toll plaza building approx. 2-3 offices
    - CSC building approx. 4-5 offices
- Vehicle Transponder/Tag
  - Approx. $35 each
- Installation & Testing
  - Approx. $1 million
- Operations & Maintenance
  - Depends on a number of factors (e.g., violation rate, customer-base, HOT Lane usage, traffic volumes, hours-of-operation, etc.)
  - CSC operations approx. $30 K per month
  - VES operations approx. $25-75 K per month (depending on system factors above)
  - System maintenance approx. $125 K per year (including 24/7 operations)

Possible Funding Sources:

At this time, Caltrans District 5 is currently moving forward with a Grant Proposal to FHWA (September 2000) to obtain funding for the HOT Lane project. Along with these funds, new State or Local sources may also be identified. Other possible sources of funding include the following:

- Surface Transportation Program (STP)
- Congestion Mitigation and Air Quality (CMAQ) Improvement Program
- Regional/State Transportation Improvement Program (STIP/RTIP) funds

Follow-up Actions:

The actions necessary to implement the HOT Lane project include the following: preparing an initial feasibility report, identifying a lead agency, programming the project, possibly selecting an ITS Consultant to prepare the requirements and design, selecting a technology base, obtaining needed agreements, advertising/starting a toll program, and constructing/testing/maintaining the HOT Lane system.

At this time the project will require legislative authorization which Caltrans District 5 and the affected Local agencies need to obtain. In addition, Caltrans District 5 currently plans to install surveillance stations and communications along the SR 1 HOT Lane project area in conjunction with upcoming construction and roadway widening activities.

Project Name:
Portable Traffic Management System (PTMS)

Project Description:
Traffic management needs in rural and small urban areas are more sporadic and require smaller scale approaches. The need for traffic and traveler information is often driven by seasonal demands and/or special events. This project involves the procurement of portable traffic management and information systems (PTMS) that can be used in addressing these periodic needs. A PTMS would consist of the following ITS components, mounted on either a trailer or vehicle:

- Changeable message sign (CMS)
- Highway advisory radio (HAR) (with an area license)
- Optional digital cellular telephone for transmitting/receiving data (or an agency's own radio system could be used, if appropriate and available)
- Optional slow-scan CCTV on extendable pole

These units would be owned by a lead agency in each participating County and made available for a variety of purposes, mainly construction traffic management needs and special events (a listing of special events in the Central Coast can be found in Volume III, Working Paper No. 1). The lead agency would determine whether or not a rental fee would be charged for usage. The agency using the unit would be responsible for its proper deployment. A standard set of messages would be provided for the CMS, or unique messages could be composed. A set of guidelines would govern proper usage, to limit the potential for confusion and misuse.

Relationship to Other Projects:

- If configured with the capability to send and receive data, the PTMS units could be operated remotely, including from the Central Coast TMC or other agency TMCs
- Compatibility of communications with these TMCs needs to be considered within the PTMS design

Specific Problems or Needs Addressed:

- Traffic problems associated with special events
- Construction and maintenance traffic management needs
- Traveler information needs associated with special events

Traveler and Agency Benefits:

- Improved roadway surveillance at traffic hot spots
- Improved public information at special events

Relationship to ITS Market Packages:

- Part of Traffic Information Dissemination market package
- Will have capability of interface with Regional TMC (Regional Traffic Control market package)

Relationship to the Regional ITS Architecture:

- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Design and pilot test of one (1) PTMS unit by 2002
- Procurement of PTMS units for individual counties by 2003 (if pilot successful)

Implementing Agency:
- Lead Agency(s) will be determined on a County-by-County basis
- Caltrans District 5 will lead the PTMS pilot test

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • Portable Traffic Mgmt. Sys. (CMS, HAR, & CCTV)	$130,000	$13,000	$19,500	$19,500	$13,000	$195,000	$13,000	Per PTMS

Possible Funding Sources:
- CMAQ, STP, and local general funds
- Rental revenue by event managers (but operation by qualified agency staff)

Follow-up Actions:
- Define specific functions and parameters for PTMS pilot test
- Based on results of PTMS pilot, procure systems for Counties (as required)

Project Name:
Curve/Grade Speed Warning System

Project Description:
This project provides real-time traveler information to motorists regarding safe travel speeds, particularly in relation to upcoming curves/bends and downgrades. When a speeding vehicle is detected (using radar detectors), a changeable message sign (CMS) is activated which displays a warning message "YOU ARE SPEEDING -- 72 MPH" or " 60 MPH CURVES AHEAD". The CMS will have a telephone connection to the Central Coast TMC to display messages other than vehicle speeds. CCTV can also be installed to monitor traffic conditions and allow the Central Coast TMC to see if there has been an accident. Many rural areas within each of the Central Coast Counties are considering curve/grade speed warning systems, especially in San Benito County along SR 25 and SR 156.

The application of advance curve/grade speed warning systems is just moving out of the experimental stage in California. The first project of this nature was recently installed along a section of I-5 between Redding and Dunsmuir (otherwise known as the Sacramento River Canyon) as part of the California-Oregon Advanced Transportation Systems (COATS) program.

Relationship to Other Projects:
- Can be used in conjunction with CCTV, CMS, Surveillance Stations, and "Smart" Call Boxes
- Provides input to and dissemination outlet for the Central Coast TMC

Specific Problems or Needs Addressed:
- Motorists traveling too fast for roadway conditions
- Higher accident rates at sharp curve/bend and steep downgrade roadway segments
- Roadway network safety improvements in a cost-effective manner

Traveler and Agency Benefits:
- Improve roadway network safety, especially in high accident areas (e.g., sharp curves, bends, steep downgrades, etc.)
- Decrease the number of accidents
- Reduce travel speeds when motorists are traveling too fast for roadway conditions

Relationship to ITS Market Packages:
- Part of the Advanced Safety Systems market package

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystem

Time Frame
- Long-term

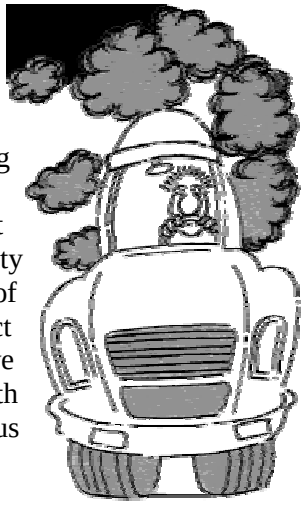
Implementing Agency:
- Caltrans will be the lead agency

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Advanced Safety Systems • Curve/grade warning system	$70,000	$7,000	$10,500	$10,500	$7,000	$105,000	$7,000	Per location

- Within the COATS program, Caltrans District 2 reported that the construction costs for each advance curve warning system was approx. $100 K per location

Project Name:
Emissions Monitoring and Management



Project Description:
Provides information for monitoring vehicle emissions and air quality and developing emissions/air quality improvements strategies. This project uses advanced vehicle emissions testing systems to provide information to identify environmental "hot spots" and implement strategies to reroute traffic away and around sensitive air quality areas, or control access to such areas. Other technologies provide identification of vehicles that are exceeding local, state, and federal levels of pollutants. This project provides information to drivers or fleet operators to enable them to take corrective action. The service also provides transportation planning and operating agencies with information that can be used to facilitate the implementation and evaluation of various pollution control strategies.

Relationship to Other Projects:
- Monitoring emissions plays a very important role in obtaining Local, State, and Federal funding for regional projects
- Additional funding sources may become available (or not) based upon the results of emissions monitoring

Specific Problems or Needs Addressed:
- Gathered information can be used to implement Travel Demand Management (TDM) programs, policies and regulations
- Environmental "hot spots" can be determined
- Management of emissions will, ultimately, lead to improved air quality
- Additional funding for projects may become available, based upon the need for monitoring data

Traveler and Agency Benefits:
- Improved vehicle emissions monitoring at traffic/transit hot spots
- Provides information to assist in the development of emissions improvement strategies

Relationship to ITS Market Packages:
- Related to Regional Traffic Control, Network Surveillance, Planning Data Collection, and Commercial Vehicle Operations market packages

Relationship to the Regional ITS Architecture:
- Part of Emissions Management (Center) subsystem

Time Frame:
- After 2010

Implementing Agency:
- Regional Air Quality Management District (AQMD)
- Local Air Pollution Control District (APCD)

Project Name:
Standard Railroad Grade Crossings

Project Description:
Manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition). These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.

Relationship to Other Projects:
- Coordination with traffic signal synchronization/coordination systems, where appropriate

Specific Problems or Needs Addressed:
- Increased safety at key railroad crossings

Traveler and Agency Benefits:
- Develops user information systems that display accurate, timely, and useful information on expected train crossings and anticipated delays

Relationship to ITS Market Packages:
- Part of Network Surveillance and Incident Management market packages

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short- to long-term

Implementing Agency:
- Caltrans, local agencies, San Luis Obispo, Grover Beach, SLO County, and Paso Robles

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Std. RR Grade Crossing	$55,000	$5,500	$8,250	$8,250	$5,500	$82,500	$5,500	Per location

Project Name:
Advanced Railroad Grade Crossings

Project Description:
Manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This includes all capabilities from the Standard Railroad Grade Crossing and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems include positive barrier systems, which preclude entrance into the intersection when the barriers are activated. Like the Standard Package, the HRI equipment is activated on notification by wayside interface equipment, which detects, or communicates with, the approaching train. Additional information about the arriving train is also provided by the wayside interface equipment so that the train's direction of travel, its estimated time of arrival, and the estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

Relationship to Other Projects:
- Coordination with traffic signal synchronization/coordination systems, where appropriate.

Specific Problems or Needs Addressed:
- Increased safety at key railroad crossings

Traveler and Agency Benefits:
- Develops information systems that display accurate, timely, and useful information on expected train crossings and anticipated delays

Relationship to ITS Market Packages:
- Related to the Network Surveillance and Incident Management System market packages

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

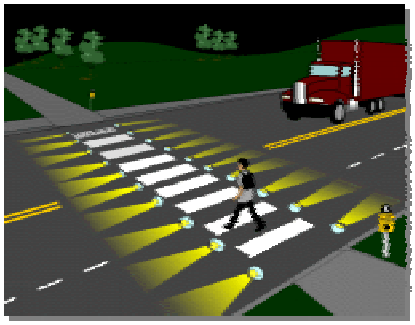
Time Frame:
- Short- to long-term

Implementing Agency:
- Caltrans, local agencies, San Luis Obispo, Grover Beach, SLO County, and Paseo Robles

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Adv. RR Grade Crossing	$75,000	$7,500	$11,250	$11,250	$7,500	$122,500	$7,500	Per location

Project Name:
Advanced Crosswalks



Project Description:
Provides surveillance/detection equipment for critical pedestrian crosswalk locations. Depending on the individual crosswalk, this could include audible signal change indications, security monitoring, and/or visible warnings to drivers of pedestrians in the crosswalk. Locations would be determined by local agencies by prioritizing the most hazardous locations for pedestrian-vehicle conflicts.

Relationship to Other Projects:
- Coordination required with traffic signal coordination and pre emption systems

Specific Problems or Needs Addressed:
- Pedestrian safety and security at critical crosswalk locations

Traveler and Agency Benefits:
- Improved safety
- Improved traffic operations

Relationship to ITS Market Packages:
- Part of Network Surveillance and Incident Management System market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) subsystem

Time Frame:
- Short- to long-term

Implementing Agency:
- Cities of Santa Barbara, Arroyo Grande, Buellton, Solvang, San Luis Obispo, Atascadero, Paso Robles, Hollister, Monterey, and Santa Cruz,
- Santa Barbara County, Caltrans, and other local agencies

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Advanced Safety Systems • Advanced crosswalks	$30,000	$3,000	$4,500	$40,000[1]	$3,000	$80,500	$3,000	Per crosswalk

1. Denotes actual installation costs.

TRANSIT MANAGEMENT

Project Name:
Transit Vehicle Tracking using Automated Vehicle Location (AVL) Systems

Project Description:
Transit Vehicle Tracking provides for an Automated Vehicle Location (AVL) System to track the transit vehicle's real-time schedule adherence and updates the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle [e.g., global positioning satellites (GPS), dead-reckoning systems, etc.] and relayed to the infrastructure or may be determined directly by the communications infrastructure [e.g., automatic vehicle identification (AVI), beacon systems, etc.]. A two-way wireless communication link with a transit management center will be used for relaying vehicle position and control measures. Fixed-route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The transit management center will process this information, update the transit schedule and make real-time schedule information available via the Internet, transit center(s), and selected bus stops. The application and time frame will vary by transit property within the Central Coast. Each transit agency will need to define the extent of deployment expected. Transit systems in Santa Barbara and San Luis Obispo are expected to be among the first to deploy transit vehicle tracking equipment.

Relationship to Other Projects:
- Provides data for transit information, schedule management, dispatching, and transit priority systems
- Can be connected to the Central Coast TMC to provide for multi-modal functionality

Specific Problems or Needs Addressed:
- Transit efficiency and effectiveness
- Better planning data
- Inter-Agency communication

Traveler and Agency Benefits:
- Improved transit scheduling
- More efficient timed transfers
- Improved travel time performance for transit travelers

Relationship to ITS Market Packages:
- Functions as the Transit Vehicle Tracking market package
- Can be inter-related to the Broadcast Traveler Information and Traffic Control market packages

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (at the discretion of individual transit agencies)

Implementing Agencies:
- SBMTD, SMAT, CCAT, SLO Transit, PRCATS, SCAT, Ride-On, SBCE, MST, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Vehicle Tracking • AVL (vehicle) • AVL (system)	 $15,000 $500,000	 $1,500 $50,000	 $2,250 $75,000	 $2,250 $75,000	 $1,500 $50,000	 $22,500 $750,000	 $1,500 $50,000	 Per transit vehicle Includes training

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Public Transportation Mgt. • Vehicle • Transit Mgt. Center	 $4 K $600 K - 1 mil.	 $2.5 K $200-300 K	• Capital Costs → System software, hardware, on-board devices, communications, computers, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Santa Cruz METRO Automatic Vehicle Location (AVL) System

Project Description:
As an ongoing effort to enhance its public Transit Management Systems, Santa Cruz METRO will deploy an Automatic Vehicle Location (AVL) system to support several management functions. In the near term, AVL will be deployed on up to four transit coaches as a demonstration project to test the utility of an automated route and stop announcement system. The automated route and stop announcement system, or "Talking Bus" will use recorded audible announcements and visual displays to enhance bus stop and route information delivery to passengers with visual and hearing impairments as required by the Americans with Disabilities Act (ADA). The appropriate pre-recorded message will be triggered at key intersections, transfer points and transit centers by an on-board positioning system that receives geographic coordinates from the Global Positioning Satellite (GPS) network. The "Talking Bus" technology will allow the coach operator to focus on the primary driving task, and will provide reliable, consistent information to passengers.

Expanding AVL equipment throughout the fleet, METRO will link the on-board positioning system with a Geographic Information System (GIS) for more efficient vehicle dispatch. It would also support an Advanced Traveler Information System (ATIS) that enables passengers using a personal computer or waiting at major transit stops to obtain schedule and arrival times for a specific bus on a scheduled route.

In the long-term, a fleet-wide AVL coupled with farebox and on-board sensors may be used to accumulate passenger boarding and alighting information by stop. Currently, transit surveyors riding on the bus gather this information. Automating the collection and management of ridership information will enable more reliable information to be gathered at a lower cost.

Relationship to Other Projects:
Deploying AVL on METRO coaches will support route and bus stop annunciation for ADA requirements, enhance dispatching, enable regional ATIS for public transit and support improved data collection for planning and research.

Traveler and Agency Benefits:
- Travelers will be the primary and initial beneficiaries of METRO's AVL system
  - The first application of AVL will drive an automated route and bus stop enunciator for passengers with disabilities
  - Access to schedule and specific on-time information from a personal computer while at home or at a major transit stop will remove some of the anxiety and uncertainty associated with public transit travel
- As this system evolves, METRO will eventually use it for in-house dispatching and data collection to improve service delivery

Relationship to ITS Market Packages:
- Part of Transit Vehicle Tracking and Transit Information market packages

Relationship to Regional ITS Architecture:
- Part of Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:

- METRO is deploying the "Talking Bus" demonstration project during FY99-00 → METRO received a TDA Demonstration Program grant and FTA capital assistance to fund the initial deployment of up to four buses equipped with automatic enunciators
- Due to current service expansion requirements, METRO will explore fleet-wide deployment of AVL to support ATIS, automated dispatch, and Advanced Transit Management Systems in the next 3-5 years

Implementing Agency:

- Santa Cruz Metropolitan Transit District will be the lead agency for implementing the AVL component of ITS technology on METRO buses

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Vehicle Tracking								
• AVL (vehicle)	$15,000	$1,500	$2,250	$2,250	$1,500	$22,500	$1,500	Per transit vehicle
• AVL (system)	$500,000	$50,000	$75,000	$75,000	$50,000	$750,000	$50,000	Includes training
Transit Passenger and Fare Mgmt								
• Automated pass. counting	$5,000	$500	$750	$750	$500	$7,500	$500	Per transit vehicle
• Electronic fare collection	$10,000	$1,000	$1,500	$1,500	$1,000	$15,000	$1,000	Per transit vehicle

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Public Transportation Mgt. • Vehicle • Transit Mgt. Center	$4 K $600 K - 1 mil.	$2.5 K $200-300 K	• Capital Costs → System software, hardware, on-board devices, communications, computers, etc. • O&M Costs → Staffing & communications
En-Route Transit Information • Personal device • In-vehicle device • Interactive kiosk • Information Service Providers (ISPs)	$700 K $500 K $20-40 K $1-2 million	$300-500 $200 $10-50 K $300 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications
Electronic Payment Services • Vehicle tag/card • Tag/card reader • Management center	$25-50 $30-40 K $40-80 K	N/A $8-10 K $75-100 K	• Capital Costs → System software, hardware, vehicle tags, tag readers, communications, systems integration, etc. • O&M Costs → Power, communications, staffing, etc.

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Follow-up Actions:

- METRO is moving forward to deploy the first AVLs and enunciators
- Widespread deployment and expansion to enable ATIS, advanced transit management systems, and automated scheduling and dispatching will require procurement of additional funding sources
- In addition, public support and subsequent direction from the governing Board would be a necessary pre-requisite for the expanded deployment

Project Name:
Itinerary Information System

- Santa Barbara MTD (initial implementation)
- Other transit agencies (as interested)

Project Description:
The Southern California Association of Governments (SCAG) has implemented a system called TranStar, a system that provides routing information to individuals accessing their web site. MTD will be working with SCAG to extend that system into Santa Barbara County. The system contains information on train and bus routes from all the systems in the various jurisdictions in the Los Angeles area. Travelers access the SCAG web site (http://www.scag.ca.gov) and input information on desired origin location, destination location, and day and time of trip. The information system provides the traveler with instructions on train and bus connections that will allow that trip to be made via transit. The traveler can input location information using street names, address, or major origin/destination points/facilities.

Relationship to Other Projects:

- Part of a broader Traveler Information System → links to this web site would be provided from other Santa Barbara area web sites and the Caltrans District 5 web site

Specific Problems or Needs Addressed:

- Transit efficiency and effectiveness
- Travel information needs

Traveler and Agency Benefits:

- Improved public information for transit travelers
- Improved transit agency operations

Relationship to ITS Market Packages:

- Related to Traveler Information and Planning Data Collection market packages

Relationship to the Regional ITS Architecture:

- Part of the Transit Management (Center) subsystem

Timeframe:

- By 2001

Implementing Agency:

- SBMTD

Project Name:
Automated Passenger Counting (APC) Systems

Project Description:
This project allows for the management of passenger loading and counting on-board vehicles using electronic means. This package is implemented with sensors mounted on the vehicle to permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle. Data will be processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem using existing wireless infrastructure. Ultimately, it would be anticipated that all fixed-route transit properties in the Central Coast would be equipped with APC systems. Systems in Santa Barbara and San Luis Obispo could be expected to implement such systems in the short- to mid-term. Others would likely be in the mid- to long-term.

Relationship to Other Projects:
- Coordinated and integrated with the Electronic Fare Collection project

Specific Problems or Needs Addressed:
- Efficiency of transit operations
- Quality of service for transit riders

Traveler and Agency Benefits:
- Improved data availability
- Improved efficiency

Relationship to ITS Market Packages:
- Part of the Traveler Information and Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to mid-term → Santa Barbara and San Luis Obispo
- Long-term → Other transit agencies (as desired)

Implementing Agency:
- Individual transit agencies (when need is determined to exist and funding becomes available)

Potentials Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Passenger and Fare Mgmt • Automated pass. counting	$5,000	$500	$750	$750	$500	$7,500	$500	Per transit vehicle

Project Name:
Electronic Fare Collection using "Smart" Cards

Project Description:
Allows for the collection of fare payments on-board vehicles using "Smart" Card technology. Several payment approaches can be used, but it is important that the approaches be coordinated with other "Smart" Card applications in the Central Coast and elsewhere in the state of California in order to promote seamless operation. The electronic fare collection system is implemented with readers mounted on the vehicle to permit fare payment or authorization to ride through an electronic pass. Data is processed, stored, and communicated as needed to the Transit Management Subsystem using wireless infrastructure. The system is tied into social services billing mechanisms to serve as the accounting system for inter-agency transfers of funds, based on ridership. Transit properties in Santa Barbara and San Luis Obispo are expected to be the first to implement such systems in the Central Coast. Operators in other jurisdictions will follow, or as otherwise determined through local priorities.

Relationship to Other Projects:
- Needs to be integrated with the Automated Passenger Counting project

Specific Problems or Needs Addressed:
- Transit efficiency and effectiveness
- Better planning data

Traveler and Agency Benefits:
- Reduced cash-handling
- More automated accounting systems
- Faster boarding, reduced dwell times
- Improved data availability
- Improved efficiency overall

Relationship to ITS Market Packages:
- Part of Transit Passenger and Fare Management market package
- Must be coordinated with Demand Response Transit Operations and Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (depending on the transit property)

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, PRCATS, SCAT, Atascadero SBCE, MST, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Passenger and Fare Mgmt • Electronic fare collection	$10,000	$1,000	$1,500	$1,500	$1,000	$15,000	$1,000	Per transit vehicle

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Electronic Payment Services • Vehicle tag/card • Tag/card reader • Management center	$25-50 $30-40 K $40-80 K	N/A $8-10 K $75-100 K	• Capital Costs → System software, hardware, vehicle tags, tag readers, communications, systems integration, etc. • O&M Costs → Power, communications, staffing, etc.

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
"Smart" Card Deployment Program

Project Description:
The Santa Barbara MTD has recently been awarded funds for the purchase of new fareboxes. The SBMTD is planning to ensure that these devices be compatible with the eventual deployment of a "Smart" Card system. Essentially, a "Smart" Card is a computer on a card, which can store far more information than magnetic stripe cards → whole databases, in fact. The greater memory of the chip enables a single "Smart" Card to be used for a multitude of applications.

By creating a partnership between the City of Santa Barbara, SBMTD, UCSB, and SBCC, a "Smart" Card can be developed that handles everything from fare collection, city parking, and student services. Passes can be purchased from a variety of locations throughout the Santa Barbara area, providing the public with greater accessibility. The beauty of a "Smart" Card is its flexibility and ability to link agencies together for the benefit of the public. In addition, new employer programs can be worked out with the private sector to help encourage the use of public transportation.

The SBMTD is also interested in pursuing the deployment of a Shared/Station Car program that could benefit from the implementation of a "Smart" Card system. The Shared/Station Car program is a separate ITS Project that is defined in another document.

Relationship to Other Projects:
- This project would benefit the Shared/Station Car project by providing a mechanism for payment of use of a shared station car
- Should be coordinated with other "Smart" Card projects throughout the State to allow for as broad an application as possible

Specific Problems or Needs Addressed:
- Need for efficient, convenient payment methods, adaptable to multiple services

Traveler and Agency Benefits:
- Deployment of a common smart card allows for significantly greater convenience for travelers
- Improves efficiency of agency accounting systems

Relationship to ITS Market Packages:
- Part of the Electronic Fare Collection market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to medium-term

Implementing Agency:
- Santa Barbara Metropolitan Transit District (SBMTD)

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Passenger and Fare Mgmt • Electronic fare collection	$10,000	$1,000	$1,500	$1,500	$1,000	$15,000	$1,000	Per transit vehicle

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Electronic Payment Services • Vehicle tag/card • Tag/card reader • Management center	$25-50 $30-40 K $40-80 K	N/A $8-10 K $75-100 K	• Capital Costs → System software, hardware, vehicle tags, tag readers, communications, systems integration, etc. • O&M Costs → Power, communications, staffing, etc.

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Transit Video Surveillance

Project Description:
This project involves deployment of security systems to perform surveillance and warn of potentially hazardous situations both on-board vehicles and at transit centers (e.g., unmanned train stations, park-and-ride lots, etc.). Each geographic area will have its own criteria for the implementation of such devices but, in general, implementation will be triggered by a known security issue at each location. The method of surveillance will be determined based on the specific needs at each site, either monitoring with an observer at the transit management center or monitoring that is triggered by an event, such as detected movement in a parking lot. The system will be similar to other security systems that have been implemented throughout the U.S. The communications approach will depend on location and type of monitoring contemplated. Security problems for transit in the Central Coast are limited, and widespread implementation is not anticipated.

Relationship to Other Projects:
- Feeds information to a transit management center

Specific Problems or Needs Addressed:
- Safety/security in areas with known security problems

Traveler and Agency Benefits:
- Improved safety/security
- Reduced on-site labor to address patron security, with possible reduced costs

Relationship to ITS Market Packages:
- Part of the Transit Security market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) subsystem

Time Frame:
- Medium- to long-term

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCE, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Public Travel Security • In-vehicle device • Fixed location • Emergency center	 $4-5 K $6-8 K $500 K	 $500 $6-8 K $75-100 K	• Capital Costs → System software, hardware, on-board devices, communications, video surveillance, computers, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Voice/Data Communications

Project Description:
This project addresses the needs for communications enhancements to support a variety of transit management ITS applications. Radio systems will generally need upgrading to allow for the communication of transit vehicle location back to the Transit Management Center. In addition, improved voice communications will be a benefit to system operation as well. Each transit operator will need to evaluate their current communications system in light of the Transit Management functions they would intend to include. Multiple transit systems in the same geographic area should have their AVL and communications implemented under a single system to allow for economies of scale.

Relationship to Other Projects:
The communications systems will need to work together with the Transit Vehicle Tracking project, and may need to provide support for Transit Security and Electronic Fare Collection, depending on how the systems are ultimately configured.

Specific Problems or Needs Addressed:
- Need for voice and data communications between the vehicles and the transit management center
- Need for reporting maintenance problems
- Transit security

Traveler and Agency Benefits:
- Improved passenger safety and security
- Improved efficiency of transit operations
- Mechanism for real-time monitoring and traveler information

Relationship to ITS Market Packages:
- Part of Transit Security market package, but supports Transit Tracking market package as well

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (each system to make their own assessment)

Implementing Agency:
- Individual transit operators, SBMTD, SMAT, CCAT, SCAT, SBCE, MST, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Security • Voice/data communications	$10,000	$1,000	$1,500	$1,500	$1,000	$15,000	$1,000	Per transit vehicle

Project Name:
Transit Signal Priority System

Project Description:
Traffic signals disrupt the progress of transit vehicles by causing them to slowdown or stop. This can be a serious problem when a transit vehicle is behind schedule. Since other vehicles in cross-traffic appear to have the right-of-way, hazardous situations occur at intersections. The purpose of this project is to give specially equipped transit vehicles priority (or right-of-way preferential treatment) at traffic signalized intersections. Basically, the transit vehicle activates (via radio signals, beacon system, loop detectors, etc.) a signal priority phase (within an equipped intersection traffic controller), adding green time to the signal phase for the on-coming transit vehicle. The green phase can be brought-on early or extended for a pre-set time between 5-45 seconds. A visual verification system (either in-vehicle or installed in the field) is used to confirm to the transit driver that it has been given the right-of-way.

Relationship to Other Projects:
- Inter-related to traffic signal control, signal coordination strategies, and central traffic control
- Inter-related to transit vehicle tracking/AVL systems
- Could be coordinated with emergency vehicle pre-emption systems
- Could be coordinated with the Central Coast TMC

Specific Problems and Needs Addressed
- Potentially hazardous situations at signalized intersections
- Transit vehicles behind schedule
- Disruption to traffic flow at intersections

Traveler and Agency Benefits:
- Improved intersection safety (vehicle and pedestrian)
- Improved ability of the transit vehicle to get back on schedule
- Overall smoother flow of traffic when a transit vehicle passes through an intersection

Relationship to ITS Market Packages:
- Part of the Multi-Modal Coordination market package
- Related to the Surface Street Control market package

Relationship to the Regional ITS Architecture
- Part of the Transit Management (Center), Traffic Management (Center), Roadway (Roadside), and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (depending upon the local community)

Implementing Agency:
- Individual transit operators, SBMTD, SMAT, CCAT, SCAT, SBCE, MST, and SCMTD
- Local agency traffic departments

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Multi-modal Coordination								
• Signal priority (vehicle)	$2,000	$200	$300	$300	$200	$3,000	$200	Per transit vehicle
• Signal priority (intersection)	$2,500	$250	$375	$375	$250	$3,750	$250	Per intersection

Project Name:
Transit Maintenance

Project Description:
This project supports automatic maintenance scheduling and monitoring. On-board condition sensors monitor critical system status and transmit critical status information to the transit management center. Hardware and software in the transit maintenance center processes this data and schedules appropriate maintenance activities. Information regarding passenger loading, bus running times, and mileage accumulated will help improve service and facilitate administrative reporting. Automatically recording and verifying performed tasks will also enhance transit personnel management. These functions may also be implemented in a way that does not require communications with the transit management center, but focus on improved vehicle diagnostics, which are evaluated when the vehicle returns to its garaging location. Each transit property will need to evaluate its own needs and determine what functions should be included. The most likely scenario is that these functions will be gradually introduced as new vehicles are purchased, based on options offered by the manufacturer.

Relationship to Other Projects:
- The transit management center may need to accommodate communications of maintenance information to and from the transit vehicles, depending on configuration

Specific Problems or Needs Addressed:
- Need to minimize transit vehicle down time and prevent breakdowns

Traveler and Agency Benefits:
- Provides information that can be used to maintain transit system
- Promotes increased transit system reliability
- Allows systematic response to maintenance problems by transit agencies

Relationship to ITS Market Packages:
- Part of the Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (depending on system)

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCE, MST, and SCMTD

Project Name:
Santa Barbara MTD Vehicle Maintenance System

Project Description:
SBMTD's operations could benefit greatly from the use of new and innovative technology that assists maintenance personnel to maintain the SBMTD's fleet of transit vehicles. Historically, maintenance is an area that has been overlooked by companies interested in deploying technology in the transit industry. The SBMTD believes that in order to produce a reliable and efficient transit system, great care must be taken in maintaining transit vehicles.

SBMTD intends to create a more efficient method of communication between mechanics and supply personnel as well as provide mechanics with all of the information they require directly to their work area. By deploying networked computers and touch screens to the mechanics, vehicle information can be passed between SBMTD personnel quickly. Mechanics can easily determine the location of parts and place orders that can be quickly filled by supply personnel and delivered to the mechanic. If the necessary parts are not in stock a mechanic can defer the work order and move on to another job with no loss of time. Also, the SBMTD can store vehicle diagrams and instructions about each vehicle on a network server and the images and text can be accessed by the mechanic directly from his assigned work area. Naturally, the complete history of each vehicle including parts and labor performed can be accessed by the mechanic. This provides the mechanic with all of the information required to complete their task.

Commercial packages that perform the majority of tasks envisioned by the SBMTD currently exist. This project would require the need for modifications and integration to the SBMTD's existing internal systems.

Relationship to Other Projects:
- The SBMTD transit management center may need to accommodate communications of maintenance information to and from the transit vehicles, depending on configuration

Specific Problems or Needs Addressed:
- Need to keep buses operational
- Need to minimize in-service breakdowns

Traveler and Agency Benefits:
- Increases efficiency of maintenance personnel
- Increases diagnostic abilities and reduces chance of bus breakdown

Relationship to ITS Market Packages:
- Part of the Transit Maintenance market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short-term

Implementing Agency:
- Santa Barbara Metropolitan Transit District (SBMTD)

Project Name:
Static Transit Route/Schedule Information

Project Description:
This project provides information in response to a traveler request. The approach for transit agencies in the Central Coast is to provide as much information on schedules, routing, and fares on their web sites. Some agencies have already implemented such systems, and these will be maintained and upgraded. Other agencies will be implementing such systems over the next several years. It is anticipated that the development of wireless internet technologies will allow this information to be obtained from mobile locations as well as from fixed personal computers, within the next several years. Kiosks may be established in key locations (e.g., hotels, transit centers, office parks, etc.) that provide access to this information through the internet. However, telephone/voice based information on routes still needs to be maintained.

Relationship to Other Projects:
- In Santa Barbara, this project is related to the Itinerary Information System
- Stepping-stone towards more sophisticated applications under "Real-Time Route/Schedule Information"

Specific Problems or Needs Addressed:
- Need for basic transit route and schedule information

Traveler and Agency Benefits:
- Provides easy, immediate access to information on transit routes, schedules, and fares
- Interactive kiosks provides remote access to information
- Availability of information on the internet reduces agency staff resource requirements

Relationship to ITS Market Packages:
- Part of Transit Traveler Information market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) subsystem

Time Frame:
- Short-term

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCE, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
En-Route Transit Information • Personal device • In-vehicle device • Interactive kiosk • Info Service Providers (ISPs)	 $700 $500 $20-40 K $1-2 million	 $300-500 $200 $10-50 K $300 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Real-time Transit Route/Schedule Information

Project Description:
Some transit agencies will take the next step in sophistication of transit traveler information, providing real-time information on schedules and arrival times. The system would allow the user to request and obtain current information regarding real-time transit vehicle location and arrival time at given points. This information could be delivered in multiple ways, and each transit agency may decide to implement different levels of sophistication. One level would be to provide information on bus location on the agency web site. This is a relatively simple and cost-effective application, once the AVL system and communication of that information to the transit management center are in place. The web site would show current vehicle location, so that travelers at home, office, or other location could see how close the bus is to its expected schedule. Kiosks or other displays can be provided at key locations (e.g. office lobbies, hotels, transit center, etc.) that display the web site, either on a continuing basis or as a user-selected feature.

Relationship to Other Projects:
- Will rely on data from the Automated Vehicle Location (AVL) system

Specific Problems or Needs Addressed:
- Need for information on bus location and schedule adherence

Traveler and Agency Benefits:
- Real-time information of transit routes, schedules, and fares
- Multimedia access to information
- Easy access to connecting service information

Relationship to ITS Market Packages:
- Part of Transit Traveler Information market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) subsystem

Time Frame:
- Medium- to long-term

Implementing Agency:
- SBMTD, CCAT, SLO Transit, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
En-Route Transit Information • Personal device • In-vehicle device • Interactive kiosk • Info Service Providers (ISPs)	 $700 $500 $20-40 K $1-2 million	 $300-500 $200 $10-50 K $300 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Passenger Train Arrival Status Message System

Project Description:
This project would locate signs at remote train stations in Santa Barbara County:

- Surf
- Goleta
- Guadalupe
- Carpinteria

The purpose of the message sign network is to systematically apprise the traveling public of train arrival status. The signs will be controlled by AMTRAK. Communication to the signs could be through dial-up communications, given that passenger trains arrive only several times per day. AMTRAK already maintains a train schedule information system, and the messaging system would simply tap into that information.

Relationship to Other Projects:

- Should be integrated with the Santa Barbara transit management center to allow bus drivers to better coordinate with train arrival and departures, where bus service is provided

Specific Problems Addressed:

- Need to know about delays in train arrival
- Traveler Information

Traveler and Agency Benefits:

- Provides traveler information
- Promote use of train travel.

Relationship to ITS Market Packages:

- Supports the Broadcast Traveler Information and Interactive Traveler Information market packages

Relationship to the Regional ITS Architecture:

- Part of the Transit Management (Center) subsystem

Time Frame:

- By 2005

Implementing Agency

- AMTRAK, Caltrans (Rail Programs Division), and Regional Transportation Planning Agencies

Possible Funding Sources:

- SHOPP, ITIP, RTIP, and RSTP

Follow-up Actions:

- In SBCAG 1999 RTP
- PSR development by Caltrans
- At least one station in '98 STIP

Project Name:
Station and Bus Stop Information System

Project Description:
SBMTD recognizes that providing route and schedule information to passengers at bus stops and transit stations is a necessity. Currently, the SBMTD provides route and schedule information in paper form at a number of its bus stops and the transit center. However, what most people want to know is the time at which the next bus is actually going to arrive. The SBMTD is interested in providing that information to bus stops, transit stations and the home via the use of existing technologies.

The SBMTD plans to purchase software and hardware that when integrated with a Global Positioning System (GPS) can relay information directly to equipment installed at bus stops and stations that display the estimated time of arrival of the nearest transit vehicle. It is the intention of the SBMTD to make this information available via the Internet. The SBMTD believes that by providing actual arrival times to the public in their home or place of business transit becomes a more attractive alternative. The public can continue reading their paper or drinking coffee in the comfort of their home and not concern themselves with missing the bus.

Currently, there are existing commercial packages that when integrated with a GPS system can provide the desired information to bus stops and transit stations. The Internet aspect of this project would require the development of a new application.

Relationship to Other Projects:
- This project requires the deployment of the On-Board Passenger Information System

Specific Problems or Needs Addressed:
- Need for bus arrival time information

Traveler and Agency Benefits:
- Provides expected bus arrival time at specific locations, allowing passengers to optimize their use of time

Relationship to ITS Market Packages:
- Part of the Transit Traveler Information market package
- Works together with the Transit Vehicle Tracking market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to medium-term

Implementing Agency:
- Santa Barbara Metropolitan Transit District (SBMTD)

Project Name:
Santa Barbara On-Board Passenger Information System

Project Description:
The SBMTD is anticipating providing its passengers with real-time information and entertainment. In order to enhance transits status as an alternative to the automobile, the SBMTD recognizes the need to provide its passengers with real-time information as well as furnish them with a higher level of comfort.

The most obvious need for real-time information on-board a transit vehicle is automated bus stop announcements. By providing passengers with automated bus stop announcements, you remove some of the uncertainty associated with public transportation thus creating a passenger friendly environment. Likewise, this system would address ADA requirements pertaining to many of our disabled passengers. Entertainment is a new concept for public SBMTD believes that service, comfort, cleanliness and accessibility are the overriding factors in attracting large segments of the community. By providing entertainment to our passengers, SBMTD can make their commute a more pleasurable experience.

Many commercial packages available to transit can make the majority of this project a reality. By deploying a Global Positioning System (GPS) and purchasing a Bus Stop Announcement System the real-time passenger information aspect of this project is accomplished. The entertainment portion can be handled by the use of Flat Panel monitors and on-board computers that run a continuos loop of content. The content can consist of public information, community events and advertising. The advertising aspect of this project can help offset some of the costs associated with this type of system. Enhancing the public's commute with real-time information and entertainment will increase ridership.

Relationship to Other Projects:
- By deploying a GPS system, the SBMTD can move forward on two other projects such as a GIS Passenger Information System and a Station & Bus Stop Information System

Specific Problems or Needs Addressed:
- Need for up-to-the-minute information on bus location and schedule adherence

Traveler and Agency Benefits:
- Provides information on bus location and arrival time so that passengers can better plan their trip
- Provides added level of convenience in taking transit

Relationship to ITS Market Packages:
- Part of the Transit Traveler Information market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to medium-term

Implementing Agency:
- Santa Barbara Metropolitan Transit District (SBMTD)

Project Name:
Santa Barbara Transit GIS Information Systems

Project Description:
The SBMTD is embarking on a complete transformation of the way transit is provided to the Santa Barbara region. Many of SBMTD's existing routes are scheduled to change to increase the likelihood of attracting the choice rider. SBMTD will continue to provide outstanding service to the entire community but as congestion remains an on-going problem SBMTD's revamped service is designed to assist the City and other agencies in dealing with the problem. SBMTD has acquired funds to deploy over 30 new electric vehicles throughout the Santa Barbara area. By replacing diesel fuel vehicles with electric's Santa Barbara County will benefit environmentally.

With all of the changes planned for the next few years, it is imperative that the SBMTD's methods of tracking passenger trips be accurate and detailed. The SBMTD is pursuing the possible purchase of software and hardware that will allow the SBMTD to track boardings and destinations. This information will provide SBMTD's planning department with data that will be utilized to make decisions about route and schedule changes. In addition, SBMTD's marketing department can use the information to target certain areas of the community for promotional events.

With a GPS system in place, the SBMTD can integrate passenger counters and farebox information to provide accurate data pertaining to the location and passenger classification for each person boarding the bus. Likewise, the number of people disembarking at each bus stop can be tracked. The SBMTD would also require a commercial GIS package that allows staff to import this information into a database and link it with additional information.

Relationship to Other Projects:
- This project requires the deployment of the On-Board Passenger Information System

Specific Problems or Needs Addressed:
- Need for data to support more effective route and schedule planning

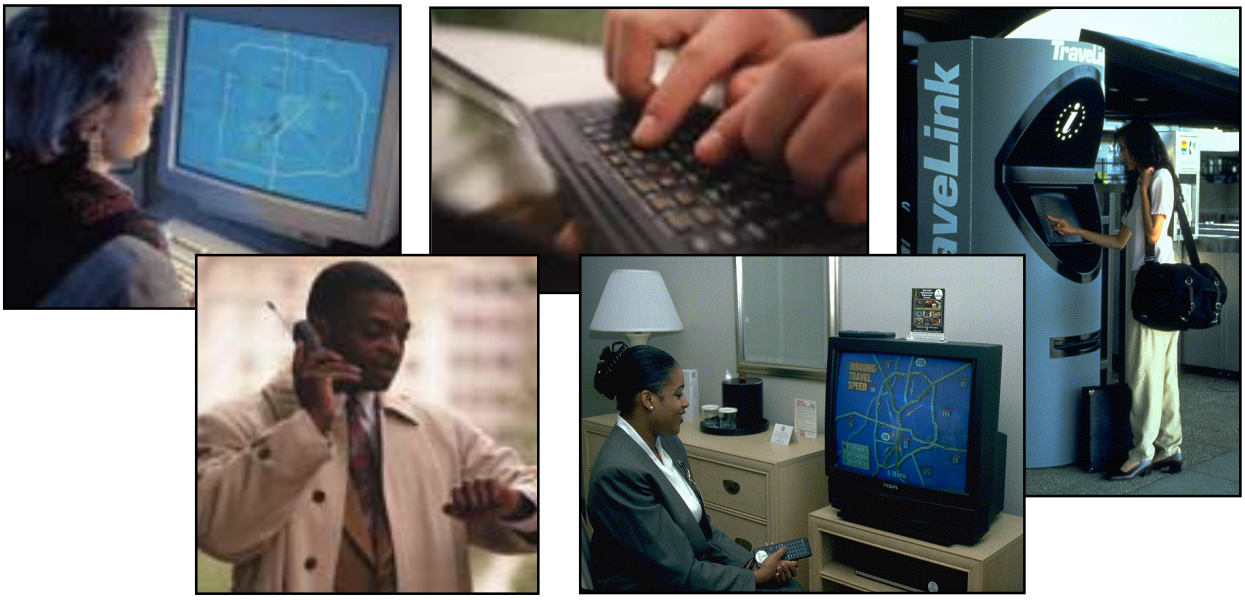
Traveler and Agency Benefits:
- More responsive adjustments in schedule and routing
- More efficient and comprehensive collection of data for SBMTD

Relationship to ITS Market Packages:
- Part of Static Route/Schedule Management market package
- Supports Planning Data Collection market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to medium-term

Implementing Agency:
- Santa Barbara Metropolitan Transit District (SBMTD)



TRAVELER INFORMATION SYSTEMS

Project Name:
Broadcast Traveler Information

Project Description:
This project anticipates the availability of multiple possible outlets for traveler information. Commercial radio provides an existing outlet for broadcast traveler information, but is subject to the limitations of commercial radio airtime. Devices are becoming available for obtaining information through pagers, palm computers, personal digital assistants, and other devices. The Internet can now be accessed through wireless devices as well. The purpose of this project is to design information "packets" that can be given to information service providers (ISPs) and distributed via these multiple channels. This information could include traffic congestion information, reports on delays on specific bus routes, train arrival information, parking information, event information, etc. Such a system would be ideal for disseminating information on the status of public emergencies, such as earthquakes and floods. Devices on which this information would be broadcast could be purchased by travelers through the commercial marketplace. Agencies may wish to purchase such devices and install them at appropriate locations (e.g., office lobbies, transit centers, hotels, etc.). Ideally, the consolidation of this information would be taken on by the private sector. The public sector would organize the information under its control and make it available. In some cases, public agencies may be a distributor of this information, as in the case of transit information projects, discussed earlier.

Relationship to Other Projects:
- This information brings information from multiple projects together → transit, traffic, incident management, emergency management, and parking

Specific Problems or Needs Addressed:
- Need for traveler information integrated across a spectrum of types
- Need to coordinate and consolidate traveler information across agencies
- Need for information on status of public emergencies

Traveler and Agency Benefits:
- Improved information for route choice
- Reduced travel time because of better knowledge of congestion and incident locations
- Immediate knowledge of weather conditions, enabling better decisions and information to the public

Relationship to ITS Market Packages:
- Part of the Broadcast Traveler Information market package
- Related to multiple other market packages → Network Surveillance, Incident Management System, Transit Vehicle Tracking, and Traffic Information Dissemination

Relationship to the Regional ITS Architecture:
- Part of the Remote Traveler Support (Traveler) and Information Service Provided (Center) subsystems
- Related to the Personal Information Access (Traveler), Traffic Management (Center), and Transit Management (Center) subsystems

Time Frame:
- Short- to medium-term
- Will be implemented in stages (as technologies become available and as the information becomes increasingly available)

Implementing Agency:
- Information Service Providers (ISPs), Caltrans, and CHP with the support from other public agencies

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Smart Traveler Services • Personal device • In-vehicle device • Interactive kiosk • Info Service Providers (ISPs)	 $700 $500 $20-40 K $1-2 million	 $300-500 $200 $10-50 K $300 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Broadcast Traveler Information • Basic Information Broadcast • Personal Basic Information Reception	 $750 K $150 K	 $550 K $50 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications • Assumes → 100 PDAs & Route Guidance

Adapted from "Developing Traveler Information Systems Using the National ITS Architecture", FHWA, 1998

Project Name:
Interactive Traveler Information

Project Description:
This project is an extension of the Broadcast Traveler Information project. It takes the same consolidated information database and makes it available in interactive form. This will allow for travelers to obtain more targeted information that will assist them in travel decisions. Possible applications in the Central Coast include telephone-based systems (both wireline and wireless), and interactive kiosks. In all likelihood, this will be an Internet application. It is expected that, once the information from multiple sources is consolidated, that agencies and private entities may choose to install kiosks at appropriate locations. These locations cannot be pre-determined, but are likely to include airports, hotels, office lobbies, event centers, etc. Any hand-held device that can access the Internet will also be able to tap into this information.

Relationship to Other Projects:
- This information brings information from multiple projects together → transit, traffic, incident management, emergency management, and parking

Specific Problems or Needs Addressed:
- Travel information needs for transit, congestion, emergencies

Traveler and Agency Benefits:
- Improved information for route choice
- Reduce travel time and delays
- Immediate knowledge of traffic and transit conditions, enabling better decisions and information to the public
- Improved mobility and service responsiveness
- Access to real-time information on transit network
- Service efficiency and resource management

Relationship to ITS Market Packages:
- Part of the Interactive Traveler Information market package
- Supports and is supported by a variety of other market packages → Network Surveillance, Regional Traffic Control, Planning Data Collection, Incident Management System, and Transit Management

Relationship to the Regional ITS Architecture:
- Part of the Personal Information Access (Traveler) and Information Service Provided (Center) subsystems
- Related to the Remote Traveler Support (Traveler), Traffic Management (Center), Transit Management (Center), and Emergency Management (Center) subsystems

Time Frame:
- Medium-term

Implementing Agency:
- Caltrans, local agencies, and Information Service Providers (ISPs)

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Smart Traveler Services • Personal device • In-vehicle device • Interactive kiosk • Info Service Providers (ISPs)	 $700 $500 $20-40 K $1-2 million	 $300-500 $200 $10-50 K $300 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Interactive Traveler Information • Interactive Infrastructure Information • Remote Interactive Reception	 $650 K $1 million	 $200 K $100 K	• Capital Coasts → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications • Assumes → 40 Kiosks & Pre-Trip Planning

Adapted from "Developing Traveler Information Systems Using the National ITS Architecture", FHWA, 1998

Project Name:
Yellow Pages and Reservation

Project Description:
This project enhances the Interactive Traveler Information package by providing an interactive yellow pages directory with reservation capabilities. In the Central Coast, it is envisioned that this capability will be implemented by the private sector through access to the Internet. Public agencies can be involved by providing information and capabilities on the Internet that can be accessed from either fixed or mobile media. Examples would involve the ability to make a dial-a-ride reservation through an Internet site or to update one's smart card account. From the private side, a host of information and reservation applications are possible → hotel, rental car, dinner, theater, etc. Focusing these applications through the Internet will ensure the broadest possible access.

Relationship to Other Projects:
- This project could be an add-on service to Interactive Traveler Information

Specific Problems or Needs Addressed:
- Travel information needs

Traveler and Agency Benefits:
- More convenient means of obtaining targeted information and making reservations

Relationship to ITS Market Packages:
- Part of the Yellow Pages and Reservation market package
- Linked to a wide range of other applications → Demand Response Transit Operations, Transit Traveler Information, and Real-Time Transit Schedule Information

Relationship to the Regional ITS Architecture:
- Part of the Remote Traveler Support (Traveler) and Information Service Provider (Center) subsystems
- Related to Traffic Management (Center), Transit Management (Center), and Information Service Provider (Center) subsystems

Time Frame:
- Short-term

Implementing Agency:
- Caltrans, CHP, local agencies, ISPs, and the private sector in general

Project Name:
Alternative Transportation Trip Planning Information for Tourists via ITS Systems

- Submitted by the Santa Barbara County Air Pollution Control District
- In coordination with the American Lung Association of Santa Barbara and Ventura Counties and the "Take a Vacation from Your Car" project group

Project Description:
The purpose of this project is to provide tourists with information that will help them plan and take trips to this area using alternative transportation, or a combination of automobiles and alternative transportation. The project will work to ensure that traveler information systems include a range of transportation options of use to tourists, including information on transit bus, train, highway bus, airplane, biking, and walking alternatives. The project will focus on compiling and extending information available via ITS systems (either planned or already under development) to ensure accessibility of this information for the tourist traveler.

The goal is to reduce congestion and air pollution associated with traffic along US 101 and in downtown Santa Barbara. The information will be designed to encourage tourists to take alternative transportation to this area, and to use alternative transportation while they are visiting the area. The two issues are related; travelers may be more likely to take alternative transportation to arrive in the area if they are educated about transportation options available once they arrive.

Relationship to Other Projects:
This project will incorporate information from:

- AMTRAK
- Caltrans
- Traffic Solutions
- Air carriers that fly into Santa Barbara airport
- Air carriers that fly into Los Angeles airport
- Bus, van and limousine services that transport travelers to Santa Barbara hotels from: Los Angeles airport, Santa Barbara airport, Amtrak stations, and other locations
- Transit bus operators in the county (including trip planner information currently under development by Santa Barbara Metropolitan Transit District)
- Sources for information on bicycle routes, rentals, etc.

The "Take a Vacation from Your Car" project is developing additional information that would be used by this ITS project, including web pages and a map of the downtown area featuring alternative transportation options. In addition, the "Take a Vacation from Your Car" project will be promoting alternative transportation options to tourists, and, once this ITS project is completed, could be used to promote the availability of the trip planning system to tourists. The project could be extended to cover the Central Coast Region (as necessary).

Specific Problems or Needs Addressed:
Santa Barbara County currently exceeds state and federal health-based air quality standards. Cars and trucks are responsible for more than half the problem. In addition, traffic along US 101 and in the downtown Santa Barbara area are recognized problems in this area. According to the Santa Barbara Conference and Visitors Bureau, a large number of tourist travelers to this county are weekend travelers from the greater Los Angeles area. If this group and others could be encouraged to leave their cars at home and arrive here by train, plane,

or bus, we could reduce air pollution and traffic along US 101 and in town. We could further reduce traffic in town, if tourists who still choose to drive reduce the number of car trips they take while here.

Traveler and Agency Benefits:
- Reduces traffic on US 101
- Reduces traffic on city streets from residents and tourists finding alternatives to the congested US 101
- Reduces traffic in the downtown Santa Barbara area
- Reduces air pollution
- Strengthens and supports the tourist industry while reducing its impacts on the environment
- Reduces pressure on increasing the number of parking spaces downtown
- Travelers are better able to plan trips, waste less time sitting in traffic, have fewer concerns about parking.

Relationship to ITS Market Packages:
- Part of Broadcast Traveler Information and Interactive Traveler Information market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center), Transit Management (Center), and Information Service Provider (Center) subsystems

Time Frame:
- Early implementation working with existing systems → 2000-2001
- Expansion to include planned systems → 2002 onward

Implementing Agency:
- Santa Barbara APCD as lead agency
- Coordination with the American Lung Association of Santa Barbara and Ventura Counties, and other partners in the "Take a Vacation from Your Car" project group

Project Name:
System of Traveler Information Kiosks and Internet Website

Project Description:
This project involves the installation of traveler information kiosks at various locations in Santa Cruz County (e.g., transit centers, tourist destinations, downtown areas, UCSC, etc.) and the availability of this information via an Internet website. Elements in this network could include prefabricated kiosks installed where appropriate electrical and telephone/cellular service is available. Each kiosk would hold one or more computers to access the necessary information. This information could be fed directly from a transportation management center (TMC), downloaded from a TMC website (as needed), or gleaned from several different websites that would link to other systems (e.g. San Francisco Bay Area, Monterey Peninsula, State information sites, etc.). The information kiosk could serve as a two-way communications terminal: it would give travelers information on transportation availability and transportation providers notice of specific types of transportation demands. A TMC would be an ideal link allowing the kiosk to disseminate a full range of travel information. By employing the Internet as a conduit, it would be possible to start with less than a full range of information (say from a transit management center) and add capacity as possible.

Relationship to Other Projects:
- This project would be dependent upon other projects to feed information to it
- As stated above, the kiosks could be in place before a full range of information is available and positioned to take advantage of new assets as they come on line

Specific Problems or Needs Addressed:
- The kiosk would be ideally situated to help alleviate the problem of information distribution
- Users would have access to up-to-date, across-the-board information from all transportation providers
- It would be possible for transportation providers to receive short timeframe information on specific demands upon the system

Traveler and Agency Benefits:
- With proper placement, the kiosks would allow both casual and regular users ease of access to real-time transportation information
- This access in turn would allow travelers to choose the most efficient mode/route to employ for a journey
- By giving travelers the ability to choose the best mode/route, the kiosk should cause a leveling out of demands as different modes/routes are selected

Relationship to ITS Market Packages:
- Part of Traveler Information Dissemination market package

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Transit Management (Center) subsystems

Time Frame:
- 2002 or after

Implementing Agency:

- The lead agency would need to be identified → one possibility is the Santa Cruz County Regional Transportation Commission (SCCRTC)
- Supporting agencies would be Caltrans, Santa Cruz Metropolitan Transit District (SCMTD), and local public works agencies (i.e., information suppliers)

Possible Funding Sources:

- Possible sources of funding are Surface Transportation Program (STP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), or Regional/State Transportation Improvement Program (STIP/RTIP) funds

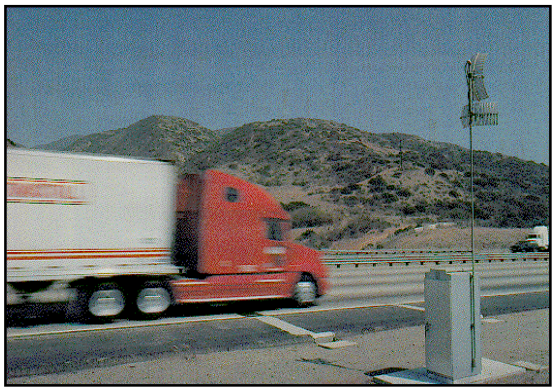
Follow-up Actions:

- The actions necessary to bring this project to fruition are → preparing an initial feasibility report, identifying a lead agency, programming the project, selecting a consultant to implement the program, selecting a technology base, obtaining needed information sharing and right-of-way agreements, constructing and testing kiosk, and determining/implementing a maintenance program

COMMERCIAL VEHICLE OPERATIONS (CVO)

Project Name:
Commercial Vehicle Operations (CVO) Projects

- Electronic Clearance
- Commercial Vehicle Administrative Processes
- Weigh-in-Motion
- Roadside CVO Safety
- HazMat Management



Project Description:
These projects are grouped together because they represent a class of projects that fall into the domain of a combination of the state of California and the private sector. Strategies association with these projects are generally determined and budgeted in Sacramento. However, these projects can benefit the Central Coast through the facilitation of goods movement into, out of, and through the Region. The most pertinent to Central Coast strategies is HazMat Management. The CHP, fire departments, and emergency medical services are charged with managing hazardous materials incidents, and Caltrans may supply cleanup and traffic management support. The principal local initiatives to be considered include public notification (through a variety of information outlets discussed in other projects), resource deployment (HazMat cleanup teams), and traffic management. Law enforcement and emergency service agencies generally keep logs of resources that may be required for dealing with HazMat incidents. The availability of this information electronically through enhanced CAD systems or other similar systems can improve response.

Relationship to Other Projects:

- Communications would be tied into the Central Coast Transportation Management Center (TMC)
- Various traveler information systems/technologies would be available for CVO use

Specific Problems or Needs Addressed:

- Goods movement into, out of, and through the Region
- Knowledge of the whereabouts of CVOs hauling HazMat loads
- Improve ability to plan roadway maintenance and rehabilitation due to excess heavy freight movements
- Traveler information for CVO use

Traveler and Agency Benefits:

- Improve goods movement into, out of, and through the Region
- Provide timely information to truckers road network status
- Reduces recurring congestion and to some extent incident-related congestion by reducing the quantity of freight truck movement on the road network

Relationship to ITS Market Packages:

- Electronic Clearance, Commercial Vehicle Administrative Processes, Weigh-in-Motion, Roadside CVO Safety, and HazMat Management are each a market package

Relationship to Regional ITS Architecture:

- Part of the Freight and Fleet Management (Center), Commercial Vehicle Administration (Center), Commercial Vehicle Check (Roadside), and Commercial Vehicle (Vehicle) subsystems

Time Frame:
- Long-term

Implementing Agency:
- California Department of Motor Carriers, Caltrans, CHP, and California Trucking Association

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Automated Roadside Safety Inspection • Vehicle • Inspection Site	$2 K $50-75 K	$50-100 $5 K	• Capital Coasts → On-board electronic sensors & monitors, roadside beacons, hand-held devices, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
CVO Fleet Management • Vehicle • Fleet Mgt. Center	$2 K $500 K - 1 mil.	$200-250 $150-200 K	• Capital Coasts → Vehicle location system, condition & cargo monitoring, vehicle manifest data, data radio communications system, software, hardware, systems integration, etc • O&M Costs → Staffing & communications
CVO Electronic Clearance • Vehicle • Border Checkpoint	$800 - 1 K $300-400 K	$200 $30-50 K	• Capital Coasts → . ID tags, roadside readers, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
CVO Administrative Processes • Fleet Mgt. Center • Administrative Center	$500 K $600 K	$400 K $400 K	• Capital Coasts → System software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
On-Board Safety Monitoring • Vehicle • Commercial vehicle	$300 $1.5 K	$20-50 $500 - 1 K	• Capital Coasts → System software, hardware, data communications, position determination, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Monterey Bay Regional Freight Logistics Center

Project Description:
This project involves the conduct of a detailed feasibility assessment of the development of a regional freight logistics center for the Salinas Valley of the Monterey Bay area, a combination of urban and rural areas. Current shipping practices and communications in the fresh fruit and vegetable industry contribute to congested arterials and highways as truck drivers, unable to receive information on load availability, must make multiple trips to a site to check on load status. A truck driver typically stays 1.5 to 3 days in Salinas to fulfill their load obligations. A freight logistics center would provide centralized communication among the coolers, the trucking company dispatch centers and/or drivers, and a central dispatch facility. The central dispatch facility would receive real-time information from the coolers about load availability, parking availability, and traffic conditions [via the Central Coast Transportation Management Center (TMC)]. A large central staging area or, alternatively, several distributed staging areas and a large truck stop would also be included in the analysis. The assessment will incorporate the following aspects

- Project definition
- Site(s)-specific evaluation(s) and selection
- Site(s) master plan development
- Engineering cost estimates
- Estimates of potential truck revenues
- Financing recommendations
- Truck count and survey study to model expected community traffic benefits
- An extensive National ITS Architecture compliant communications system is expected to be the backbone of this study

A Regional Freight Logistics Center may be found feasible and recommended from this proposed assessment. Thus, this ITS sample project information sheet includes both the feasibility assessment as well as the development of the logistics center itself.

Relationship to Other Projects:
- If found feasible, a Regional Freight Logistics Center would reduce congestion on local roads and highways in and around Salinas due to agricultural freight movement
- As such, it could be considered potentially preemptive to some infrastructure enhancements and maintenance
- Additionally, if implemented, communications would be tied into the Central Coast TMC

Specific Problems or Needs Addressed:
- Recurring congestion in Salinas and the surrounding highway network
- Incident-related congestion due to more frequent roadway maintenance and rehabilitation due to excess heavy freight movement
- Provision of facilities (lodging, food, recreation, etc.) for truck drivers waiting on their loads
- Integrated communications for truck drivers checking on the availability of their loads and the condition of the road network

Traveler and Agency Benefits:
- Provide timely information to truckers on load availability and road network status
- Reduces recurring congestion and to some extent incident-related congestion by reducing the quantity of freight truck movement on the road network
- Provides facility whereby truckers are able spend downtime

Relationship to ITS Market Packages:
- Part of the Automated Dispatch/Information System market package

Relationship to Regional ITS Architecture:
- Part of the Freight and Fleet Management (Center) subsystem

Time Frame:
- 2001 for Feasibility Assessment
- By 2006 for Logistics Center (if warranted)

Implementing Agency:
- Feasibility Assessment
    - AMBAG would be the lead agency
    - Supporting partners include Caltrans, California Trucking Association, Grower-Shipper Vegetable Association of Central California, Monterey County Agricultural Commissioner's Office, Monterey County Farm Bureau, City of Salinas, and Transportation Agency for Monterey County
- Logistics Center
    - Project lead TBD

Possible Funding Sources:
- Feasibility Assessment → TEA-21 (ITS and TCSP)
- Logistics Center → TBD

Follow-up Actions:
- Work with potential funding agencies, legislative representatives, and project partners to achieve funding for detailed feasibility assessment
- Project sponsor and partners to develop action plan for Logistics Center based on feasibility assessment recommendations

EMERGENCY MANAGEMENT & ENFORCEMENT

Project Name:
Emergency Response

Project Description:
This project involves a series of strategies that may be employed to enhance the response of law enforcement and emergency services and use their resources more efficiently. These strategies may include:

- Improvements to intra- and inter-agency communications systems
- Emergency vehicle tracking/AVL systems
- Enhanced Computer-Aided Dispatch (CAD) systems
- Working with the private sector to extend cellular phone coverage to more rural areas

The State of California is considering a major upgrade to the communications systems for the CHP and associated agencies. Other agencies in the Central Coast should support and coordinate with this initiative so that the resulting communications system allows for seamless communications with local agencies, for more efficient handling of incidents. Currently, agencies must go through their dispatchers to convey messages from one agency to another. Cellular phones are sometimes used to supplement agency radio systems, but during major events, the public cell phone system may be clogged.

Tracking of emergency vehicles through GPS/AVL systems is an important consideration that goes along with the communications upgrade. This would allow for rapid identification of the location of response units and reduced response times. State and local agencies will be making decisions on these systems in the coming years based on cost and perceived benefit.

Decisions on enhanced CAD systems are generally tied together with these other two systems. Over time, it is expected that more emergency service vehicles will be equipped with on-board terminals from which a variety of functions can occur, from checking criminal records to being able to display traffic information. Other public agencies, such as Caltrans, can enhance the usefulness of these systems by designing information so that it can be readily integrated into the enhanced CAD systems.

Finally, the upgrading of the cellular phone network can have a variety of benefits, in terms of improved incident detection in rural areas to improved communications among emergency service agencies during incident response. Caltrans and the CHP should work with the private sector to encourage further development of the cellular network throughout the Central Coast.

Relationship to Other Projects:

- These four activities are highly inter-related among themselves and with incident management initiatives of Caltrans and CHP

Specific Problems and Needs Addressed:

- Need for faster emergency response
- Need for better field communications among emergency service agencies
- Need for optimum resource allocation to enable coverage of all emergencies

Traveler and Agency Benefits:
- Faster response for citizens in accident/emergency situations
- Better use of CHP and other emergency service personnel and resources
- Reduced delays from faster incident response

Relationship to ITS Market Packages:
- All of these can be considered elements of the Emergency Management market package

Relationship to the Regional ITS Architecture
- Part of the Emergency Management (Center) and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Short-term (but up to State of California and local emergency service agency budgeting decisions)

Implementing Agency:
- CHP, local police and sheriff's departments, fire departments, and emergency medical services

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Emergency Vehicle Management • Vehicle • Emergency center	 $3 K $50-75 K	 $400 $100 K	• Capital Coasts → On-board electronic sensors, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Emergency Vehicle Signal Priority System

Project Description:
Traffic signals disrupt the progress of emergency vehicles by causing them to slowdown or stop. Since other vehicles in cross-traffic appear to have the right-of-way, hazardous situations occur at intersections. The purpose of this project is to pre-empt traffic signals to give specially equipped emergency vehicles the right-of-way. Basically, the emergency vehicle activates (via radio signals, audial/sirens, etc.) a signal pre-emption phase (within an equipped intersection traffic controller), giving a green light to the on-coming emergency vehicle and switching all pedestrian crossings to the "DON'T WALK" message. The green light can be held for a pre-set time between 5-45 seconds. A visual verification system, usually consisting of a white light and a blue light, is installed next to the regular traffic signal. When the white light is activated, this confirms to the emergency vehicle driver that it has been given the right-of-way. The blue light indicates that the intersection is being controlled by an emergency vehicle approaching from another direction. An in-vehicle verification system could also be used.

Relationship to Other Projects:
- Inter-related to traffic signal control, signal coordination strategies, and central traffic control
- Inter-related to emergency vehicle tracking/AVL systems
- Could be coordinated with transit signal priority systems
- Could be coordinated with the Central Coast TMC

Specific Problems and Needs Addressed
- Potentially hazardous situations at signalized intersections
- Emergency vehicle delays passing through an intersection
- Disruption to traffic flow at intersections

Traveler and Agency Benefits:
- Improved intersection safety (vehicle and pedestrian)
- Reduction in emergency vehicle response times
- Overall smoother flow of traffic when an emergency vehicle passes through an intersection

Relationship to ITS Market Packages:
- Part of the Emergency Routing market package
- Related to the Surface Street Control market package

Relationship to the Regional ITS Architecture
- Part of the Emergency Management (Center), Traffic Management (Center, Roadway (Roadside), and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (depending upon the local community)

Implementing Agency:
- Emergency medical services and local agency traffic departments

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Emergency Routing								
• Signal pre-emption (vehicle)	$2,000	$200	$300	$300	$200	$3,000	$200	Per transit vehicle
• Signal pre-emption (int.)	$5,000	$500	$750	$750	$500	$7,500	$500	Per intersection

Project Name:
Mayday Support

Project Description:
Mayday systems have the potential in rural areas to dramatically reduce response times to collisions, and as the number of deployed systems grows, emergency service providers must be in a position to fully respond to mayday calls. It is expected that mayday systems themselves will be a private initiative, similar to the General Motors "OnStar" system, in which motorists in trouble can directly access their mayday provider, who can then take an action (e.g., send a tow truck), or notify public authorities. It is hoped that the private providers will screen the emergencies so that only those true emergencies will be reported to the authorities for response. This is particularly important in rural areas, given the commitment of resources to respond to incidents in remote areas.

This project involves CHP and other emergency service coordination with private providers to make this system as efficient an error-free as possible. Extension of cellular phone coverage into more rural areas will also assist in providing a more efficient emergency response, and the CHP and local police/sheriffs offices should coordinate with the communications companies in this regard.

Relationship to Other Projects:
- Information from the Central Coast TMC may be useful in facilitating emergency response
- Likewise, information on incidents that comes through the mayday system may be appropriate for inclusion in TMC incident logs for notification of other parties

Specific Problems and Needs Addressed:
- Typically long emergency response times in rural areas
- False calls in rural areas, resulting in waste of resources

Traveler and Agency Benefits:
- Faster response times
- Better utilization of agency resources

Relationship to ITS Market Packages:
- Part of Mayday Support market package.
- Related to Emergency Management market package.

Relationship to the Regional ITS Architecture:
- Part of the Emergency Management (Center) and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Coordination should be initiated immediately with the private sector to explore expansion in cellular coverage and coordination of mayday and Public Safety Answering Points

Implementing Agency:
- CHP and local police and sheriffs' departments

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Emergency Notification & Personal Security • Personal or in-vehicle device • Fixed location (on kiosks) • Emergency center (incremental)	$500 - 1K $100-150 $150 K	$100-200 $1 K $5-10 K	• Capital Coasts → On-board electronic sensors, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications

Adapted from "Advanced Transportation Systems Program Plan: 1996 Update", Caltrans, 1996

Project Name:
Enforcement Projects

- Red Light Enforcement
- Stop Sign Enforcement
- Neighborhood Speed Monitoring

Project Description:
Technologies have become available that can automate certain enforcement functions. One of those which is rapidly increasing in popularity is red light enforcement. This is intended to reinforce safer driver behavior by monitoring movement through signalized intersections, taking a picture of the license plate of violating vehicles, and sending either a warning or a ticket to the offending party by mail. Cities implementing such systems have noted a reduction in red light violations. The technology is implemented through cameras mounted at intersections, having the ability to detect when vehicles have passed through on red and to photograph the license plate.

Similar technology can detect the failure to stop at "STOP" signs or to detect speeding vehicles in neighborhoods. All of these types of projects, because they are controversial, need to come through local initiatives. Local agencies can support the decision-making process by clearly explaining the intent and to ensure that systems are properly working. Improperly working equipment can easily cause ill feelings and credibility problems in the community. These strategies are best applied by targeting them to known problem areas.

Relationship to Other Projects:

- In general, these are stand-alone projects, but require coordination with the Departments of Motor Vehicles to trace license numbers.

Specific Problems and Needs Addressed:

- Unsafe driving behavior such as speeding and failure to stop

Traveler and Agency Benefits:

- Low-cost method of enforcing good driver behavior

Relationship to ITS Market Packages:

- Part of the Enforcement market package

Relationship to the Regional ITS Architecture:

- Part of the Emergency Management (Center) subsystem

Time Frame:

- Systems exist for immediate implementation (but decisions will come through local initiatives)

Implementing Agency:

- CHP and local police and sheriffs' departments

Possible Funding Sources:

- Some companies install systems for free (if given permission to collect fines and share portion of fine with local jurisdictions)